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Second National Conference on General Aviation Airport Noise and Land Use Planning. Summary of Proceedings: A Dialogue to Balance Needs

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Second National Conference on General Aviation Airport Noise and Land Use Planning

SUMMARY OF PROCEEDINGS

DECEMBER 1-3, 1981

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This report constitutes the proceedings of the three day Second National Conference on General Aviation Airport Noise and Land Use Planning. The main purpose of the Conference was to continue the dialogue initiated at the First National Conference which took place in October of 1979 in Atlanta, Georgia. The emphasis in this conference was the implementation of solutions at the State and local level. Another objective of the Conference was to develop a document that would be useful to those dealing with general aviation airport noise and land-use planning. This report is intended to serve this purpose.

The attendees at this Conference showed a greater awareness of the general aviation airport noise situation that at the first Conference. The airport operators and the planners have become more knowledgeable in this area, perhaps due, in part, to ANCLUC studies at several general aviation airports.

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SECOND NATIONAL CONFERENCE ON GENERAL AVIATION AIRPORT NOISE AND LAND USE PLANNING

SUMMARY OF PROCEEDINGS:
A DIALOGUE TO BALANCE NEEDS

INTRODUCTION AND SUMMARY

The main purpose of the Second National Conference on General Aviation Airport Noise and Land-Use Planning was to continue the dialogue initiated at the First National Conference which took place in October of 1979 in Atlanta, Georgia. The emphasis in this conference was the implementation of solutions at the State and local level. Another objective of this Conference was to develop a document that would be useful to those dealing with general aviation airport noise and land-use planning. This report is intended to serve this purpose.

The attendees at this Conference showed a greater awareness of the general aviation airport noise situation than at the first Conference on this subject held in 1979. The airport operators and the planners have become more knowledgeable in this area, perhaps due, in part, to ANCLUC studies at several general aviation airports.

THE SYSTEM AND ITS IMPACTS

The general aviation system includes all flying activities except those conducted by the airlines and the military. In encompasses about 99 percent of the airplanes in the civil fleet, 85 percent of the total hours flown, and 84 percent of the total operations at FAA tower-operated airports. General aviation airports serve an important business purpose in local, State, and national economies. These airports provide a link from smaller communities to passenger and freight air carrier service throughout the nation.

In the last six years, a net overall reduction in the number of GA airports has occurred through closings and abandonments. This has been primarily due to development/economic pressures to use airport land for purposes which produce greater financial gain or increased tax base and financial instability of the GA operations themselves. More recently, aircraft noise and incompatible adjacent land uses have posed an increasing threat to the very existence of general aviation airports. Even with the incorporation into the general aviation fleet of substantially quieter jet aircraft, by the year 2000 the population exposed to average annual daily day-night sound levels between 55 and 65 dB -- a range of exposure expected to cause significant adverse community response -- is expected to be 2,100,000 people. There was general agreement that general aviation airport neighbors remote from densely populated areas are more sensitive to airport noise. Legal cases resulting from airport noise exposures have found airport proprietors liable for constitutional "taking" of property rights and for nuisance damages as well.

TOOLS FOR NOISE CONTROL

Throughout the Conference, a number of tools were discussed, which could be used to improve compatibility of general aviation airports with adjacent land uses. These mechanisms included technology, airport actions, community actions, and airport/community interactions.

Advanced technology for aircraft quieting may reduce propeller aircraft levels between 5 and 10 dBA by alterations of propeller geometry and speed. For jet aircraft, technology exists for obtaining approximately 10 EPNdB reductions in jet aircraft noise levels compared to the quietest of current business jets. Although these reductions are substantial, commercialization of this technology is expected to be very slow due to its cost.

There is at present, the opportunity to reduce noise exposures in the near term through the use of quieter aircraft flight procedures.

Pilots were identified as the primary obstacle to these benefits being realized to date, due to their lack of understanding and thus cooperation.

Airport operators can undertake a number of steps to minimize noise impacts beyond their boundaries. These measures include property purchase, preferential runway usage, airport layout design, time of day restrictions and monitoring. Property acquisition can include outright purchase of noise-impacted land and purchase of development rights of undeveloped land. Preferential runway usage and airport layout can serve to reduce noise exposures by redirecting traffic away from populated areas. Time of day restrictions have limited value in general aviation, since the numbers of night operations are relatively small. Monitoring has value as a means providing feedback in educating pilots. Thus, it is a means of encouraging or enforcing the use of quieter flight procedures. However, monitoring is expensive to implement and tends to place the airport operator in conflict with the airport users.

A number of alternatives were mentioned which can be implemented by the community to increase land-use compatibility including zoning, development control, and soundproofing of houses. Zoning provides a means of restricting uses around airports to achieve noise compatibility. Its greatest limitation is that it does not provide relief from noise exposures in areas that have already been developed. Other development controls include the development of comprehensive plans, subdivision regulations, building and housing codes, capitol improvement, utility extension control, and other urban growth management techniques. Other techniques discussed at the Conference include disclosure requirements for both new structures and previously occupied structures and tax incentives to discourage development.

Neither the airport operator nor the community have access to all the tools available to solve airport noise problems. Therefore, close interaction of these parties is absolutely required for the solution of land-use compatibility problems. It was stated that the primary means of accomplishing this is the establishment of committees representing aviation and community interests which are responsible for developing airport plans. It was also stated that States can also assist localities by the passage of supportive laws such as comprehensive planning enabling legislation identifying noise as a hazard and a consideration for planning. Supportive programs conducted by State agencies can be a means of transferring experience from one locality to another. Federal support for the planning process is currently embodied in FAR Part 150 which includes airport noise exposure mapping and the development of noise compatibility programs and requires the program to be developed by the airport operator in consultation with the affected local governments and planning agencies, and airport users.

CONCLUSION: A DIALOGUE TO BALANCE NEEDS

The Conference produced a mixed picture regarding experience in resolving incompatible land uses around airports. Most participants agreed that the process had failed when litigation ensued. Experiences related by various Conference participants suggested a number of guidelines in addressing compatible land-use problems:

- Include the community as an integral part of the planning process.
- Be honest with the community and keep promises and commitments.
- Learn from experience, be flexible, and expect to compromise.
- Expect substantial effort to be required over several years to achieve community consensus.

The consensus of attendees was that if the above guidelines are taken into consideration the probability of resolving land-use compatibility issues is greatly increased.

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I. GENERAL AVIATION:
THE SYSTEM AND ITS IMPACTS

THE SYSTEM

General aviation is defined as all flying activities except those conducted by the airlines and the military. It is an industry that operates 98.5 percent of the airplanes in the civil fleet, flies 85.1 percent of the total hours flown, and makes up 84.4 percent of the total operations at FAA tower-operated airports. The GA aircraft fleet by current FAA count consists of 208,000 airplanes.

General aviation provides a number of benefits and services. General aviation airports provide the link from those communities to passenger and freight service throughout the nation which -- in the era of aviation deregulation -- are not provided with air carrier service. General aviation airports serve an important business purpose in local, State, and national economies. They provide passenger service through commuter and air taxis, as well as private and business aircraft. They provide emergency medical services to people who might otherwise die before reaching a hospital. They help in the development of natural resources in remote areas of the country. They provide a network of support and training for our national defense, as well as our commercial aviation system. The Air National Guard, the Coast Guard, and traffic helicopters all use general aviation airports. They also provide an opportunity for pleasure flying. And finally, by the air service provided by the airport, general aviation airports also enhance community image and provide development incentives for business and industry in their communities.

General aviation airports are divided into two basic categories, utility and transport airports. Utility airports are designed for all piston aircraft weighing 12,500 pounds or less and have runways up to 4,300 feet in length. This encompasses most recreational, sport, and light business aircraft activity. Transport airports provide services for larger aircraft with runways up to 10,000 feet and greater and are capable of handling aircraft up to 175,000 pounds. These airports are virtually indistinguishable from air carrier airports. They are GA transport airports, many of which are air carrier certified. In fact, all but about the fifty largest air carrier airports have more general aviation aircraft movements than air carrier movements. A special group of general aviation airports are those labeled in the National Airport System Plan (NASP) as reliever airports. These airports have the specific purpose of reducing GA activities and hence congestion at predominately air carrier airports. Relievers are generally associated with large and medium hub areas and can be utility or transport design/use category airports. They are typically given funding and development priority by FAA.

General aviation airports tend to be fiscally unstable. Approximately only the top 5 percent of these airports are self-sufficient. The poor economics of GA airports may consequently force or foster airport growth in the hope of increased financial viability (e.g., through more jet fuel sales) and result in increased problems due to the growth. Although there has been a slight increase in the numbers of publicly owned airports, there has been a net overall reduction in GA airports through closings and abandonments representing about a 7 percent reduction in the last six years. Until recently the major cause of airport closings or abandonments has been due to:

- Development/economic pressures to use airport land for purposes which produce greater financial gain or increase in tax base

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- Financial instability of operations (the close operating margins)
- Deteriorating facilities and/or safety conditions.

More recently aircraft noise and incompatible adjacent land uses have posed an increasing threat to the efficiency and capacity of the airport. For example, Westchester County, New York and Santa Monica, California have been having problems. The Van Nuys Airport (one of the largest GA airports) also has noise-induced political pressure.

ITS IMPACT

Although there are perceptible differences between air carrier noise and general aviation noise, the difference in community reaction between the two may depend, in large part, upon the specifics of individual cases. That is, how consciously an individual depends on the general aviation airport for emergency transportation service, tourism, operation of local industries, or other economic support, as well as, whether the community is considering other uses for the airport's land and whether the local government supports the airport. Noise exposures at GA airports tend to evoke the same types of responses found at air carrier airports but the GA airport neighbors may respond at lower noise levels -- an apparent result of the generally lower ambient noise levels around general aviation airports. Some question whether the community has a valid reason for this response to general aviation noise. However, one person expressed the thought at the Conference that anyone that perceives that he has a problem, has a valid problem.

With respect to community perceptions, two interesting and somewhat contradictory opinions were expressed at the Conference. First, the public does not concern itself with the category in which an airport might be defined, i.e., GA vs. air carrier. What it does not want is air carrier aircraft at that airport. Second, airport definition is important in that it may preclude air carrier operations. A specific instance cited was an effort by the airport operator at Scottsdale, Arizona to install parallel runways. This effort was quashed by the public, since it was perceived as an attempt to permit air carriers to enter.

A "broad brush" estimation of the national noise exposure impacts due to general aviation operations was presented by representatives of the U.S. Environmental Protection Agency (EPA). This analysis estimated noise exposures from 1975 to 2000 and assumed 2 percent jet operations at all GA air transport airports and the incorporation of a 15 dB reduction in jet fleet noise levels by the year 2000. The results of this study are shown in Table 1.1 where the areas given are the net populated areas exposed when the airport area is subtracted. This study notes that the total area exposed to average annual daily day-night sound level (L_{dn}) above 65 dB is relatively small. Most of the community reaction is expected to occur in the areas above L_{dn} 55 and 60 dB which are predicted to contain 1,600,000 and 500,000 people respectively by 2000. However, these estimates are conservative. The EPA points out that the percent jets in the fleet are expected to be more than 2 percent in 2000 and that a 15 dB reduction in jet fleet noise levels will probably not be achieved by year 2000.

It was reported that when airport proprietors, neighbors, and local governments were unable to resolve their conflicts, they turned to the courts for resolution. The legal case which addressed some of these problems and which laid the foundation for conflicts between airports, neighbors, and users to this day is Griggs v. Allegheny County, decided by the U.S. Supreme Court in 1962. In this case, Griggs sued Allegheny County, the proprietor of Pittsburgh Airport, for "taking" his property without paying for it when daily flights were directed over his residence at regular intervals that resulted in loss of sleep and structural damage to the residence. The Supreme Court agreed, ruling that because Allegheny County had not acquired enough land for its airport, it had to pay damages for land which it was in fact using but for which it had not paid. Local airport proprietors' liability for constitutional "taking" has recently been extended by the Supreme Court of California to impose liability for nuisance damages as well (Greater Westchester Homeowner's Association v. City of Los Angeles).

TABLE 1.1

ESTIMATED EXPOSURES TO GENERAL AVIATION NOISE

DAY-NIGHT SOUND LEVEL CONTOURS (dB)	NET CONTAINED AREA (mi.^{2})		EXPOSED POPULATION	
	1975	2000	1975	2000
> 65	14	3.3	47,000	11,000
> 60 to 65	225	102	363,000	500,000
> 55 to 60	925	981	1,256,000	1,600,000

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II. TOOLS FOR NOISE CONTROL

Throughout the conference a number of tools were discussed which can improve compatibility of general aviation airports with adjacent land uses. For the purposes of this discussion, these mechanisms are grouped as:

- Technology
- Airport actions
- Community actions
- Airport/community interactions.

Discussion of these tools is summarized in this chapter.

TECHNOLOGY

Within the category of technology, two types of approaches were discussed at the conference, aircraft quieting and quieter aircraft flight procedures.

Aircraft Quieting

For propeller-driven aircraft, noise reductions can be obtained primarily through geometry changes to the propeller or by propeller speed reductions. In a NASA/EPA/MIT quiet design validation study, a "quiet" propeller consisting of longer chord, thinner tips, and slightly smaller diameter than a Cessna 172 baseline propeller resulted in nearly 5 dBA lower levels for that aircraft.

The effect of propeller speed was illustrated by data presented by Gulfstream American in which a mid-power range series of aircraft of the same basic design but with different power plant installations showed an 11 dBA reduction at 90 percent power with a 175 RPM speed reduction (the propeller speed was not given). The noise reductions were less at lower power ranges, however.

Aircraft noise level reductions for jet aircraft are primarily obtained through the application of fan-engine technology which incorporates high by-pass ratio fan design. In the Quiet, Clean General Aviation Turbofan (QCGAT) engine and aircraft propulsion system project undertaken by NASA, calculated noise levels at the FAR Part 36 measurement points were considerably lower for the high by-pass engines than for the older technology engines as shown in Table 2.1.

Although quieting technology is available which can potentially yield substantial reductions in aircraft noise levels, commercialization of this technology is hampered by cost. Furthermore, when quieter designs are available, the impact on general aviation aircraft fleet noise levels is not immediately perceptible because of the relatively long replacement time of the GA aircraft. Illustrative of the economic difficulties of commercializing quiet technology is the case described by Gulfstream American. The Gulfstream III aircraft utilizes two Spey engines which each cost $900,000. These are proven engines and have roughly 7,000 hours of operating time in aircraft sold to date. Replacement of the Spey with quieter engines would require the use of four engines (since no direct replacement exists) at a cost of approximately $700,000 each. The replacement engines would be newer but less proven and more expensive to maintain according to Gulfstream American. Gulfstream reported that these engines would cause the aircraft costs to increase from $9,500,000 for the current Gulfstream III to $12,000,000 to $13,000,000 -- a substantial increase.

Aircraft manufacturers are trying to quiet their aircraft with the primary goal of interior noise comfort which is not inconsistent with exterior noise reduction. However, the one means of forcing the introduction of quieter technology is through government regulation. FAR

TABLE 2.1

CALCULATED QUIETING BENEFIT OF NEW TECHNOLOGY FOR BUSINESS JETS

FAR 36 MEASUREMENT CONDITION/LOCATION	NASA/QCGAT AIRCRAFT CALCULATED NOISE LEVEL (EPNdB)	OLDER TECHNOLOGY BUSINESS JETS* (EPNdB)
Takeoff/Flyover	68.4	78.0 - 106.6
Takeoff/Sideline	70.6	80.3 - 105.0
Approach/Flyover	77.3	88.4 - 107.5

*Non-inclusive, reference: AOPA Noise Report, Aircraft Owners and Pilots Association, 1981.

Part 36 was introduced with the purpose of putting a lid on airport noise and gradually reducing the aircraft noise levels. Noise level limits have been established for propeller-driven large aircraft, jet aircraft, and propeller-driven small aircraft. FAA has stated that these regulations have essentially capped aircraft noise levels.

Quieter Flight Procedures

The greatest opportunity to reduce actual noise exposures in the near term is through the use of quieter aircraft flight procedures. In data presented by Gulfstream American, the area contained within a 90 EPNdB single-event level noise contour was reduced up to 76 percent depending upon procedures used (as given in Table 2.2) where the area reductions were achieved by a contraction in the sideline noise exposure with a slight elongation of the centerline noise exposure. For propeller-driven aircraft, reductions are also possible. For example, a turboprop aircraft which developed the same maximum power at both the maximum allowable RPM and with a 200 RPM reduction showed a decrease of 11.6 dBA at the lower speed (total propeller speed was not given).

In spite of the potentially substantial and immediate benefits of quieter flight procedures, they have received limited acceptance to date. Responsibility for this was largely directed to the pilots themselves for several reasons:

- Pilots are not well informed with respect to noise -- many do not perceive noise to be a problem.
- Some pilots resent being told by an airport operator how they should operate their aircraft.
- Many operations are conducted by itinerants who are unaware of or unconcerned with the problems of a specific airport.

A number of suggestions addressing this situation were made which focused on the educational process for pilots, such as:

TABLE 2.2

EFFECT OF FLIGHT PROCEDURE ON TAKEOFF NOISE LEVEL CONTOURS

FLIGHT PROCEDURE FOR TAKEOFF	AREA ENCLOSED BY 90 EPNdB SINGLE EVENT LEVEL CONTOUR (mi^2)
Full power, no noise abatement	19
FAR 36 procedure	11
Cutback to 1.2%, single engine gradient at 1000 ft. altitude	7
Cutback to power for level flight (PLF) single engine gradient at VFS	4.5

- The teaching of quieter flight procedures to pilots as an integral part of pilot training (an example was made of Northwest Airlines for which all pilots are required to fly the noise abatement procedures)
- The provision of FAA approval to quieter flight procedures to further assure pilots of the air-worthiness of the noise abatement procedures. (The flight procedure proposed by Gulfstream American to FAA is being seriously considered in this context.)
- The use of noise monitoring with citations or warnings to violators to force communications between pilots and airport operators and to help educate and sensitize pilots to the noise which they are generating.

AIRPORT ACTIONS

In most cases the general aviation airport operator does not have the responsibility or authority to control land uses beyond the airport boundaries. However, if the airport operator will realistically plan to protect the environment from maximum noise impacts in the future there are a number of steps that can be taken to minimize the exposure beyond the airport boundaries. These measures are discussed here as: property purchase, preferential runway usage and airport layout design, and curfews and monitoring.

Property Acquisition

Property "acquisition" by airport operators can take a variety of forms:

- Fee Simple Purchase -- can be implemented for new airports ahead of the airport development by the purchase of enough land to protect the airport "forever". This is particularly appropriate if there is need for industrial or other land uses which are compatible with the airport.

- Development Rights -- as implemented at the Miramar NAS, for example, the airport purchases the right to restrict certain uses on land but leaves other uses available for development by the land owner. Consequently, the land remains on the tax roles, but at a reduced value.
- Avigation Easements -- are the purchase of development rights and can be obtained by negotiation or condemnation or by dedication at subdivision approval or in conjunction with the soundproofing of residences. Easements have been critized as giving the airport the "right to make noise".
- Purchase Assurance -- one type of easement is obtained when the airport proprietor buys the exposed residential property, allowing the former owner to move if he wishes. The proprietor then soundproofs the property and resells it with an avigation easement.

Preferential Runways and Airport Layout

In many instances, considerable reductions in exposed populations can be obtained by the redirection of traffic to alternative runways on the airport. This type of approach was used successfully by the Jones Airport in Tulsa, Oklahoma where training activities were moved to a more isolated runway. This approach has to be undertaken carefully since the likelihood of shifting exposures to other neighborhoods may occur, as has happened in Pensacola, Florida (in which the plan succeeded only after interaction with the exposed neighborhoods) and at the Buford, S.C. Marine Corps Air Station (the consequences of which have been in litigation for six years).

Airports can also construct facilities such that they move aircraft operations away from noise sensitive areas, such as the Jones Airport where hangers were developed on the airport property so that they would force the movement of traffic away from the Town of Jenks. Also, runways were extended and thresholds shifted such that community noise exposures due to aircraft operations were minimized.

Curfews and Monitoring

In the landmark aviation case of *City of Burbank v. Lockheed Air Terminal, Inc*., decided by the U.S. Supreme Court in 1973, localities were prohibited from restricting their aircraft departures from a privately owned and operated air terminal. However, a footnote to that decision declared "proprietors solely by the virtue of the fact that they are liable for the damages of the aircraft noise, can impose and enforce curfews, single event noise limitations, or other restrictions." In spite of this, communities have brought pressure to bear on airport operators to force them to agree to imposing curfews, such as in the case of Westchester County Airport, NY. Generally, for general aviation airports, the numbers of night operations are relatively small and the curfew itself results in more of an apparent than real reduction in noise exposure.

Monitoring has been previously discussed as a means providing feedback and educating pilots. An additional benefit that has been cited for monitoring is as a public relations tool in working with the community and enabling the airport operator to demonstrate levels of aircraft noise influencing the community particularly in the context of other sources of environmental noise. However, its value in this regard was considered questionable by some.

Monitoring has a number of disadvantages. It is fairly expensive to implement and the variability in measured aircraft sound levels due to atmospheric propagation effects complicates the analysis of results. In addition, a monitoring program places a burden on the airport operator and can put him in an adversarial position with the aircraft operator. Airport operators are "pro-aviation" and do not wish to discourage aviation via monitoring-generated enforcement or warning letters to aircraft operators. Furthermore, it was noted that once a monitoring program is instituted, a tendency exists on the part of airport commissions to continually lower the limits.

Monitoring does allow the airport operator to identify the "good actors" and "bad actors" within its users. Within the context of a voluntary program, an airport operator can put pressures to bear on the bad actors when they make requests for airport services, such as the Port Authority of New York did at JFK Airport when an airline was seeking an additional gate position.

Public Relations

There was considerable discussion about public relations as a tool to calm a group of citizens concerned about aircraft noise. A view was expressed that public relations coupled with an action plan that reduces noise is helpful but public relations instead of an effective action plan is likely to be counter productive. Citizen groups have been "PR-ed" without results too often and it is now likely to stir up people who don't like to be considered unworthy of honest communication. The need for being honest, above board and "laying it out on the table, up front" was emphasized rather than being caught with half truths, half the story, etc. It was stressed that if the airport is going to negotiate with the surrounding communities the communities should have confidence in the airport operator's honesty. Otherwise, negotiations will be much more difficult.

COMMUNITY ACTIONS

A number of alternatives exist which can be implemented by the community to increase land use compatibility with airports. These will be discussed in the following categories: zoning, development controls, and other techniques.

Zoning

Zoning is the process by which States and their political subdivisions regulate land uses and development features. Airport zoning serves four separate purposes:

- Restricting heights of structures
- Restricting non-structural atmospheric distrubances (such as electromagnetic radiation)

- Restricting uses around airports to achieve noise compatibility
- Restricting uses around airports to promote safety.

The conventional zoning approach consists of the airport as a permitted use with the surrounding area zoned appropriately. A more innovative approach is being used around the Kansas City Airport where the zoning permits Planned Unit Development (PUD) in the surrounding areas. PUD is a development over a large area conducted under a master plan which permits the developer considerable flexibility in siting and housing densities such that residential areas can be located away from noisy areas and still allow an economically viable development.

A limitation of zoning as a protective measure is when it causes inverse condemnation, that is, the loss of use or value of land due to the zoning classification which conflicts with the Fifth Amendment right that "private property [shall not] be taken for public use without just compensation." Unfortunately, as was pointed out at the Conference, no set rules define what constitutes a "taking". Currently, the most frequently used criterion is known as the "dimunition of value" theory. This theory focuses, first, on whether the regulation serves a valid public purpose or advances a ligitimate governmental interest and, second, on the extent to which the regulation may have destroyed the value of the complaintant's property. Under this test the courts have found no takings and thus, no compensation even though the reductions of property values were quite drastic. In subsequent decisions, the courts have further declared that an ordinance which merely prevented a property from being used for purposes which would be injurious to the safety and health of the community but would not prevent the owners from using the property for other purposes had suffered no dimunition of value.

Zoning has limited value as a means of insuring compatibility of land uses near airports for the principle reason that comprehensive zoning schemes cannot replan or redevelop areas once they have become developed in non-compatible uses. Even where "in-fill" development is occuring in existing development communities, zoning regulations have limited value since residential development of these in-fill locations is likely to be more compatible with the adjacent residential uses than other uses that would be more compatible with the airport itself. These new residential developments, however, should have soundproofing required.

Development Controls

Other devices were described which can be utilized by communities to further land-use compatibility include:

- Comprehensive Plans -- gives definition and cogency to the local zoning. The usefulness of these plans depend upon State laws which give varying degrees of importance to them (For example, California, Hawaii, Florida, and other States have laws which give ordinance power to comprehensive plans.)
- Subdivision Regulations -- define the improvements required for subdivision and land use development. They can require avigation easements, soundproofing for structures, or disclosure requirements, for example.
- Building and Housing Codes -- can provide requirements for sound insulation performance in new and existing structures.
- Capital Improvement Programs -- are sometimes mandated on a State level for the allocation of funding and are part of a comprehensive planning process. They specify and define the location of schools, roads and sewers, and the airports themselves and can provide an opportunity for insuring compatibility by directing development.
- Utility Extension Programs -- similar to the Capital Improvement Programs, these programs control the timing and placement of key utilities, particularly, water and

sewerage. Residential development usually follows the installation of utilities. They can be part of an official plan of action. For example, EPA/208 Water Quality Plans, or locally guided. An example is the Utility Extension Ordinance used by Gainsville, Georgia to control utility extensions beyond city limits. This approach can be very effective in the right situation, such as around the Raleigh-Durham Airport where local soils are unsuitable for the use of on-site septic tanks thus, all development is dependent upon the availability of sewers.

- Urban Growth Management Techniques -- are various approaches which restrict a development. For example, an annual new housing limit is imposed in Petaluma, California and an urban service limit line around Lexington, Kentucky defines the extent of the area wherein fire, police, and water services are provided.

Other Techniques

Several other techniques were mentioned which are potentially useful in encouraging land-use compatibility:

- Fair Disclosure/Truth in Selling Requirements -- require that the prospective purchaser of the property be made aware of its nearness to an airport. This requirement may be mandated either by local ordinance or State law. In California, for example, a buyer of new property is required to sign a statement acknowledging awareness of an airport. However, this statement is not required for subsequent owners, a significant weakness of that law. The solution to this problem is to record this information with the deed. In Maryland, where the State aviation agencies do not have the authority to require disclosure statements, avigation easements are required when variances to develop noise impacted land are granted, primarily to have the documentation of the noise impact in the records to inform any future purchasers of that land. An approach used in Brownsville, Texas consists of building inspectors disseminating airport plan projections to the year 1990.

- Tax Incentives -- can be used to preserve compatible land uses just as they are used to protect prime agricultural land from development. With this device a property owner dedicates his land for a period of time, such as ten years and is assessed at a reduced rate accordingly. He can escape such an agreement at any time, but must pay a penalty of back taxes.
- A-95 Review Process -- a review process required for certain Federal funding programs, may provide an opportunity to identify certain noise problems.

AIRPORT/COMMUNITY INTERACTIONS

Neither the airport operator nor the community have access to all the tools available to solve airport noise problems. Communities do not have the authority to impose curfews or other restrictions on airports and airport operators seldom have the authority to specify the zoning adjacent to the airport. The point was made at the Conference that optimization of land use compatibility around airports requires utilization of all tools available, thus, the interaction of the airport and the community is required. This is best accomplished by the establishment of a committee or committees responsible to determine the tools to be used.

One approach mentioned is to have two committees, an Aviation Committee and a Community Committee. The Aviation Committee is primarily involved with air traffic and aviation facilities and the Community Committee is primarily involved with actions related to land use activities. This type of an approach was implemented in the case of the Jones Airport in Oklahoma for which a Users' Committee which consisted of aviation-related people representing all areas of interest on the airport and Citizen's Committee representing of all the concerned citizens at the public hearings were established. Although little support was obtained from the users, the interaction between the citizens and the airport staff was constructive. The result was a master plan which saved the airport significant money due to the review process and with which airport operations were totally controlled in a manner acceptable to the majority of the users and the community.

It was reported that a similar approach is used in Florida where two committees were also established: The Policy Committee includes all of the community decision makers and all of the elected representatives who can pass judgment on what can be implemented and who will ultimately be responsible for implementation. The Technical Coordinating Committee is composed of an Operations Subcommittee which reviews all operational procedures (with the exception of instrument landing procedures) and a Public Involvement Subcommittee which includes from the onset all potential adversary groups.

States can also assist localities by passage of supportive laws, such as comprehensive planning laws and enabling legislation identifying noise as a hazard and a consideration for planning. Supportive programs conducted by State aviation commissions or departments of transportation can be a means of transferring experience from one locality to another, such as the Arizona and Florida programs described at the Conference.

The Arizona Department of Transportation is pursuing an airport land use compatibility program which emphasizes public education, technical assistance to airport operators, review of local land-use decisions, and coordination of aviation planning projects with other planning programs. The Arizona DOT has developed a State Airport System Plan (SASP) which provides for the development of their airport system as well as developing and recommending ways to mitigate potential negative impacts -- of which noise is considered the most significant. Among the actions the Arizona DOT is considering, is the amending of the municipal planning enabling legislation to include airport noise as an explicit purpose for municipalities preparing comprehensive plans and adapting zoning ordinances, and to define significant levels of noise as an airport hazard so that political subdivisions can prepare airport zoning ordinances for noise as well as obstructions.

Federal support for the planning process is currently embodied in FAR Part 150 which was developed in response to the Aviation Safety and Noise Abatement Act (ASNA) of 1979 . It incorporates the experience gained through the Airport Noise and Land Use Compatibility (ANLUC) program. FAR Part 150 is designed to provide for a resolution of existing noise problems and protection against future noise problems. The FAR Part 150 program consists of two parts, an airport noise exposure map and the airport noise compatibility program. The compatibility program is developed by the airport operator in consultation with affected local governments and planning agencies and airport users during the planning as an integral part of the program. It includes the possibility of direct Federal aid for program implementation. In FAR Part 150, non-compatible land uses are defined as L_{dn} 65 dB and greater, a limitation for GA applications since in many cases noise problems exist even when the 65 dB contour is on the airport grounds.

Experience with the FAR Part 150 predecessor ANCLUC programs applied to GA airports has been mixed. An ANCLUC program was conducted at Jones Airport and was believed by the airport manager to be a definite asset in bringing about the working relationship of the community. On the other hand, an ANCLUC study was also performed at Westchester County Airport and, though considered by the airport manager not without value, was not in itself able to bring about a resolution of their noise problems.

III. CONCLUSIONS: A DIALOGUE TO BALANCE NEEDS

The Conference resulted in a lively exchange of experiences and information. There was thorough discussion of all papers and it was obvious that the conferees were experienced in this subject.

Several GA airports are having serious noise problems with adjacent communities where the noise exposure level is as low as 55 L_{dn}. These are suburban communities with relatively low background noise levels.

It was recommended that if a community thinks it has a noise problem, the airport take the situation seriously. It was also recommended that the airport not try to use public relations instead of noise reduction to pacify the community.

Airport operators were advised to be willing to negotiate, to compromise, and to take actions that will result in noise reductions. On the list of actions were:

- Get pilots to use noise abatement flight procedures,
- Use preferential runways, i.e., divert traffic away from populated areas, and
- Be willing to discuss banning noisy aircraft and time of day restrictions.

The experiences discussed brought out many points including the following:

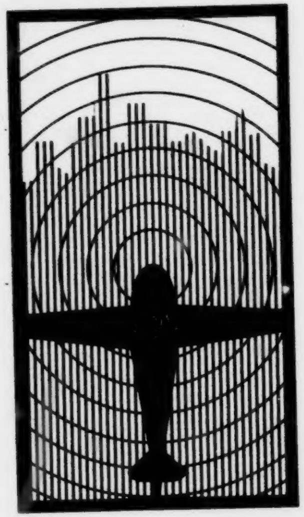
- Define community broadly, including business interests and others.
- Learn from experience -- that of yours and others.
- Keep meetings small.
- Approach community in a systematic (rational) way.
- Involve the community early and continue to involve them.
- Keep community involvement open to all.
- Be open and aboveboard.
- Keep promises and commitments.
- Assume that anyone who perceives a problem has a real problem.
- Tell people the truth, not what they want to hear.
- Have a factual understanding of the problem.
- Take the time to set up the right organization to solve the problem.
- Expect to compromise and compromise.
- Expect each problem to need a customized solution.
- Focus on implementation -- have a funding and updating process.
- Assume litigation will ensue.
- Reflect on criticism and learn from it.
- Correct errors publicly.

The attendees to this Conference exhibited considerable experience and wisdom in the resolution of general aviation noise matters. They constitute a resource for those dealing with general aviation noise in the future. The names of the attendees, the Conference agenda, and the papers presented are given in the Appendix.

SECOND NATIONAL CONFERENCE ON GENERAL AVIATION AIRPORT NOISE AND LAND USE PLANNING

APPENDIX

Second
National Conference on General Aviation Airport Noise and Land Use Planning



FINAL PROGRAM AGENDA

DECEMBER 1-3, 1981

New Orleans, LA

Sponsored by: **Office of Noise Abatement and Control,**
U.S. Environmental Protection Agency
Office of Environment and Energy,
Federal Aviation Administration

Tuesday, December 1, 1981

8:00-9:00 **REGISTRATION**

9:00-9:30 **WELCOME AND INTRODUCTION**
Environmental Protection Agency
Federal Aviation Administration

Tuesday, December 1, 1981
SESSION I
The General Aviation System

Chairman: James E. Densmore, Federal Aviation Administration

9:30-10:00 **THE GA FLEET**
Robert L. Lair, Cessna Aircraft Company

10:00-10:30 **GENERAL AVIATION NOISE REGULATIONS**
Ed Sellman, Federal Aviation Administration

10:30-11:00 **BREAK**

11:00-11:30 **THE GENERAL AVIATION AIRPORT**
John W. Reynolds, Jr., Federal Aviation Administration

11:30-12:00 **GA AIRPORT NOISE CONTROL PROGRAMS — FAR PART 150**
Robert B. Hixson, Federal Aviation Administration

12:00-1:30 **LUNCH**

Tuesday, December 1, 1981
SESSION II
Exposure to General Aviation

Chairman: Harry Johnson, NASA Headquarters

1:30-2:15	**GENERAL AVIATION NOISE IMPACT BEYOND THE AIRPORT BOUNDARY** John M. Tyler, Environmental Protection Agency
2:15-3:00	**PROGRESS IN DESIGN METHODS FOR REDUCING NOISE OF GA AIRCRAFT** J.P. Raney, NASA Langley Research Center
3:00-3:30	**FLIGHT PROCEDURES FOR NOISE CONTROL** Charles N. Coppi, Gulfstream American
3:30-4:00	**BREAK**
4:00-5:00	**PANEL A — EXPERIENCES IN GA AIRPORT OPERATIONS AND DEVELOPMENT**
5:00-6:00	**BREAK**
6:00-8:00	**COCKTAIL BUFFET**

Wednesday, December 2, 1981
SESSION III
Airports and Communities, A Balancing of Needs

Chairman: George Chapman, Chief of Planning, City of Raleigh, N.C.

8:30-9:00	**AIRPORTS — THEIR BENEFITS TO THE COMMUNITY** Judith Richards Hope, Wald, Harkridger and Ross
9:00-9:30	**AIRPORTS — HOW CAN THEY MINIMIZE THEIR NOISE IMPACT ON THE COMMUNITY** Dennis Daye, Wilbur Smith & Associates
9:30-10:00	**COMMUNITY — WHAT SHOULD IT EXPECT FROM ITS AIRPORT, E.G., LEVEL OF SERVICE (Commuter, etc.), FACILITIES, COMMITMENT TO THE COMMUNITY** Harold Leggett, Cress & Associates
10:00-10:30	**BREAK**
10:30-11:00	**LAND USE PLANNING IN THE VICINITY OF GENERAL AVIATION AIRPORTS — A CASE STUDY** Raymond J. Green, AICO, Triangle J Council of Governments
11:00-12:00	**PANEL B — HOW TO IMPROVE AIRPORT — COMMUNITY RELATIONS**
12:00-1:30	**LUNCH**

Wednesday, December 2, 1981
SESSION IV
Land Use Issues

Chairman: Robert Montgomery, MD State Aviation Administration

1:30-2:10	**CAN STATES REQUIRE COMPATIBLE LAND USE AROUND AIRPORTS ?**
	FLORIDA'S EXPERIENCE WITH STATE REGULATION OF OFF AIRPORT LAND USE Herb Brown, Florida Aeronautics Commission
2:10-2:30	**EVOLUTION OF A STATE AIRPORT LAND USE COMPATIBILITY PROGRAM** Bruce Meyers, Arizona Department of Transportation
2:30-3:00	**WHEN DOES "PROTECTIVE ZONING" BECOME A TAKING ?** Robert Barrett, Winer, Neuburger and Sive
3:00-3:30	**BREAK**
3:30-4:00	**ARE THERE ALTERNATIVES TO ZONING FOR AIRPORT PROTECTION ?** Robert Doyle, Peat, Marwick and Mitchell
4:00-5:00	**PANEL C — LEGAL ISSUES IN A GA AIRPORT LAND USE PLANNING AND PLAN IMPLEMENTATION**
5:00	**ADJOURN**

Thursday, December 3, 1981
SESSION V
Noise Control and Land Use Compatibility Planning — How It Worked ?

Chairman: Robert Koenig, Environmental Protection Agency

8:30-9:15	**CASE HISTORY — JONES AIRPORT** Richard L. Ballenger, Airports Director, City of Tulsa
9:15-10:00	**CASE HISTORY — WESTCHESTER COUNTY AIRPORT** Scott Piper, Manager, Westchester County Airport
10:00-10:30	**BREAK**

SESSION VI
Conclusions and Recommendations

10:30-11:30	**SUMMARIES BY PANEL CHAIRPERSONS**
11:30-11:45	**CONFERENCE SUMMARY**
11:45	**ADJOURN**

F

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AUTHOR PRESENTATIONS

THE GA FLEET

ROBERT L. LAIR
CESSNA AIRCRAFT COMPANY

THE GA FLEET

I appreciate being here. Jim Densmore didn't tell me how broad the topic was that he assigned me until it was too late to back out.

When you ask "Who is General Aviation"? you cover a lot of territory. An industry that operates 98.5% of the airplanes in the civil fleet -- flies 85.1% of the total hours flown and is 84.4% of the total operations at FAA tower-operated airports, and an unknown number of operations from uncontrolled airports.

General aviation is a massive transportation, freight, and working system that transports millions of people -- millions of miles every day in this complex -- complicated air transportation system we're fortunate to have in the United States.

Most people don't even know that we're there. Our airplanes are generally quiet and unobtrusive, going about their daily business from large airports 30 miles away from metropolitan centers and small airports that comfortably live in the midst of our urban sprawl and rural communities.

Unless we have an accident that hits the local newspaper, or a San Diego, that bring out the total lack of understanding by the media of the system and how it works; or even worse, a "cause celebre" generated by political motivation like Santa Monica, your average citizen just doesn't know much about general aviation.

They don't know that there are just under 815,000 pilots in the U.S., and that (eliminating student licenses) 605,000 of them are authorized to operate in the system.

If you ask your next door neighbor who is better trained -- he'd say an airline pilot -- because no one has ever told him that all pilots have to take the same tests and demonstrate the same proficiency to achieve the same ratings.

And, how are general aviation airplanes equipped to meet the system's requirements? -- The best measure is that they are installing $450 million of avionics every year -- everything from 720 channel NAV COMS to autopilots, DME, RMI, RNAV's, global NAVs, radars, radar altimeters, etc. The average high performance single engine or twin airplane is better equipped than the best of the airliners 15 years ago, and the equipment going into turboprops and jets would compare favorably with any airline equipment being flown today. In our own business, 25% of our total aircraft sales is avionics equipment.

How big is this fleet? Well, 208,000 airplanes by current FAA count -- that's an airplane for every three (3) rated pilots in the system, and I'm sure a controller's answer would be - "a hell of a lot." There are a few balloons, dirigibles, and gliders -- about 4,200, about 6,000 rotorcraft (helicopters), and the rest are all fixed wing, piston or turbine powered aircraft. Eighty percent of the fleet are single engine airplanes.

Even though it's a large fleet, flying millions of hours and miles per year and carrying millions of people on their day-to-day business and personal needs, we consume only eight-tenths of one percent (.8%) of the gasoline used in the

U.S. -- of the total aviation fuel, general aviation uses only 7.5% -- the balance is consumed by the military and the airlines.

How safe is this flying activity? Looking at the NTSB statistics on fatal accidents, it's about twice as safe today as in 1965, and our safety record has been on an improving rate constantly all through that 15-year period. We're convinced that we have not yet achieved the ultimate, and that continued reductions are possible with equipment and systems improvement, coupled with better pilot education.

That's a quick review of who general aviation is -- to summarize in a "one-liner," it's all flying activities except those conducted by the airlines and the military.

What is the future of this transportation system? In my opinion, it's going to continue to grow and become more valuable yearly as the main link between the airline hubs and the rest of the country. In 1979, 147 airline hubs enplaned 96% of the passengers, and 27 hubs accounted for 71% of that total. Today, the number of hubs is decreasing and air service to the rest of the country is solely dependent on general aviation.

The decentralization of business and manufacturing will continue, placing more and more emphasis on links between the smaller communities and the airlines.

And, the pressure of individualized air travel convenience by business and individuals will continue as people become convinced of the usefulness and economy of this form of transportation.

What will limit the growth of this system?

Today's economy and interest rates are certainly limiting growth, but that is hopefully a temporary situation. It is a credit to the viability of the industry that it has suffered no more than all other hard goods industries in these tough economic times.

The long-term limitations are:

Airports
The Air System
Taxation
Regulation

Without airports, the entire air transportation system collapses. Over ten years ago, the industry and Congress recognized this fact and established a fund to develop airports to be paid for by the users through fuel and passenger taxes. Currently, that legislation has lapsed for a year and is now in the Congress to be renewed.

Because administrations through the years have used this trust fund to assist in balancing budgets, the fund has never been fully used and has built up a multibillion dollar surplus.

Although some airports have been built, and some improved, we are continuing to see a steady decline in public use airports from a high of 7,150 in 1971 to 6,875 in 1979. It is interesting to note that private use airports have increased from 4,000 to over 8,000 in this same period of time.

It is vital that ADAP be reinstated by Congress on a fair and equitable basis, that the accumulated surplus be used to advance the construction of public use airports as rapidly as possible, and that Congress continue to appropriate funds from the trust to accomplish its original purpose.

The air system must be continually reviewed and upgraded. Part of the ADAP funds is used, both for research and development of system needs, and also the physical acquisition of the assets required to implement and expand the system. As the airline system contracts into fewer and fewer hubs and the operating airliners increase in size and efficiency and decrease in numbers, general aviation will continue to increase its percentage use of the system.

The present system has been designed and tailored to airline use -- the system of tomorrow must be designed to general aviation use since it will be, by far, the major user of the system. More attention must be given to the individual costs of using the airways. For 20 years, we have improved and redesigned the system in a way that calls for increased use of highly sophisticated avionics in the airplane. Each new system we devise adds to the individual airplane avionics requirement -- nothing is ever deleted. This proliferation of user costs has to be leveled -- or general use aviation will find itself priced out of the market. It's to the credit of the avionics industry that it has steadily brought down the cost of these "black box" requirements as the number and quantity has increased.

The capacity for greater flexibility of general aviation in system use must be recognized. The device of increasingly complicated air traffic rules tailored primarily to accommodate the rigid requirements of the airlines must be reexamined in light of general aviation's increasing use of the system.

Taxation on general aviation must be consistent with the taxes applied to all other forms of transportation - whether it be fuel, excise, property, or income taxes. There has been a tendency in the various administrations to devise punitive taxes against aviation under the guise of user taxes or other sources of income. We must make not only the national government, but also state, county, and municipal governments sensitive to the importance of general aviation in the transportation system. We have never objected to equitable taxation -- we'll continue to object to penalty taxation.

It is in the best interests of every community, county, and state government to foster the growth and well-being of general aviation. It may well be the only air link to the outside world, and I can assure you the availability of good airport facilities will have a major impact on the attitudes of business to come to your area to employ the people in that locale. When you tax general aviation, you're not "soaking the rich," you're taxing every small business and everyone who travels in your area.

Finally, regulation. Aviation is the most regulated industry in the U.S. today. Most of it is Federal, and mostly from a "benevolent despot" called the FAA. I say they are a "benevolent despot" because the FAA has the dual responsibility of fostering the growth and well-being of aviation as well as regulating it.

The FAA decides what we can build, how it will be designed, how it is tested, and how it is constructed and inspected. In addition, it controls who will fly our aircraft, what standards they will meet, and can penalize those that fly incorrectly. To top it off, they say *where* we can fly, *when* we can fly, and on *what* routes. They also determine how high and how low those flights can be made, and how much noise our aircraft can make on takeoff and landing. The FAR's are a compendium of rules and regulations that defy the ability of any single individual to know and understand.

But, our industry has grown and flourished under this control. We don't always agree, but we know where to go to solve our problems. General aviation's concern is that 50 states and thousands of municipalities are starting to add their regulations and rules in addition to those promulgated by the Federal government.

The industry cannot live with a multiplicity of overlapping and contradicting legislation whether it's on noise, or routes, or times of flights. Total chaos will result, and the industry will grind to a halt with the loss of hundreds of thousands of jobs and a transportation system for millions of people.

Let the preeminence of the Federal government over air traffic continue as it has for the entire life of the industry. If the states or municipalities feel that closer regulation is required, set up a mechanism for the states to petition the FAA for changes to satisfy the needs of the majority. If more stringent regulation of noise is necessary -- let it be mandated by FAA regulation -- at least it will be done within the ability and state-of-the-art known in the world today.

Where is general aviation going? If the constraints I've discussed do not choke off the industry, and given a satisfactory fiscal situation in the world, it will grow faster and beyond any forecasts made at this time.

Within the decade, flying in a general aviation airplane, either as a passenger, commuter, or personally, will be as commonplace as airline travel is today.

Our principal job is to make that growth possible in an orderly, safe environment.

GENERAL AVIATION NOISE REGULATIONS

ED SELLMAN
FEDERAL AVIATION ADMINISTRATION

GENERAL AVIATION NOISE REGULATIONS

In recognition of the aircraft noise problem throughout the country, Congress has enacted a series of statutes designed to afford present and future relief and protection of the public from unnecessary aircraft noise and sonic boom.

In 1968, Public Law 90-411 amended the Federal Aviation Act to require the Federal Aviation Administration (FAA) Administrator, after consultation with the Secretary of Transportation, to "prescribe and amend such rules and regulations as he may find necessary to provide for the control and abatement of aircraft noise and sonic boom." The Noise Control Act of 1972 made the EPA the "watchdog" over aviation noise by requiring FAA consultation with EPA and creating a procedure for EPA to propose noise regulations to the FAA.

The Quiet Communities Act of 1978 amended the Noise Control Act to promote the development of effective State and local noise control programs, directed the FAA to respond to EPA noise proposals within 90 days, and called for a study of the effects of aircraft noise from an airport on communities located in a State other than the State in which the airport is located. The most recent legislation, the Aviation Safety and Noise Abatement Act of 1979 emphasized airport noise compatibility planning. Bob Hixson will discuss in detail the FAA's implementation of the airport planning sections of that act.

FAA NOISE POLICY

The Aviation Noise Abatement Policy, issued jointly by the U.S. Department of Transportation and the Federal Aviation Administration in November 1976, defines the extent of and most effective approach to a national solution of the aviation noise problem. The Policy is based on a concept of shared responsibility among all elements of the air transportation community, including the Federal government, airport proprietors, State and local governments and land zoning authorities, aircraft operators, air travelers and shippers, and airport neighbors.

As the Federal agency principally concerned with aviation noise, the FAA's role is that of leadership in a national effort to reduce aircraft noise. Within the constraints of technology, productivity, and financing, the FAA is responsible for reducing aircraft noise at the source (the airplane), for promoting safe operational procedures that abate the impact of noise on populated areas, for promoting positive efforts to attain compatible land use near airports, and for supporting and sponsoring continued research and development in aircraft noise reduction.

But, the Federal government cannot solve the aviation noise problem alone. Airport proprietors are primarily responsible for planning and implementing specific actions to alleviate noise at their individual airports. This responsibility stems from the proprietor's legal liability for noise damages resulting from operations at his airport. The courts have reasoned that the airport proprietor planned the location of his airport, the direction and length of the runway there, and has the ability to acquire more land as necessary for its proper and safe operation.

Reflecting this responsibility, the proprietor has the authority to improve the design of his airport, enforce noise abatement ground operations, and restrict the use of his airport so long as those restrictions do not impede the Federal interest in safety and management of the air navigation system, are not imposed in a discriminatory manner, and do not unreasonably interfere with interstate or foreign commerce (especially as addressed in the Airline Deregulation Act of 1978).

Thus, it is clear that our goal is to reduce the impact from unwarranted aviation noise on communities surrounding our airports. We must ensure that aircraft and airport operators contribute toward reduction of noise at the source, through noise abatement operating procedures and through airport and community actions.

SOURCE NOISE REDUCTIONS

In 1969, the FAA promulgated Part 36 of the Federal Aviation Regulations, thereby imposing noise standards for all new designs of subsonic transport category aircraft and all subsonic jet aircraft, regardless of category. This put a lid on the escalation of airport noise.

In 1973, those same standards were extended to the continued production of older models. Continuing in the effort to control noise at the source, these original standards were applied retroactively in 1976 to all domestic subsonic jet aircraft over 75,000#, with compliance phased over a six or eight year period, according to type, but required all U.S. aircraft not engaged in international service to meet the standards by 1985.

The small community service exemption section of the Aviation Safety and Noise Abatement Act extended the compliance date for non-complying two-engine aircraft with a seating configuration of 100 seats or less to January 1, 1988. Section 302 of that act requires all domestic and foreign air carriers engaging in foreign air transportation to comply with FAR Part 36 or ICAO Annex 16.

In 1977, the noise standards applicable to new designs were made more stringent. These two slides compare the original certification standards with those now in effect. Aircraft that currently do not have to meet any noise standards are referred to as Stage I Aircraft; those required to meet the noise levels promulgated in 1969 are Stage II Aircraft, and those certificated to the 1977 noise levels are Stage III. Of primary interest to this group are the aircraft at the lower end of the weight scale. As you can see, the later model business jets are several decibels below the new standard on takeoff and on approach. This next slide depicts the noise certification points: takeoff - 6500 meters from start of takeoff roll along the extended runway centerline; sideline - 450 meters abeam; approach - 2000 meters from the end of the runway.

In addition to this deliberate step-by-step regulatory program to control the noise generated by large aircraft and all turbojet powered aircraft, the FAA, in 1973, banned supersonic flight by civil aircraft over the United States and in 1978 issued noise standards for civil supersonic aircraft.

PROPELLER DRIVEN SMALL AIRCRAFT

Noise standards and test procedures for propeller driven airplanes under 12,500# were issued in 1975. The noise certification methodology described in Appendix C of FAR Part 36 for transport category aircraft was considered to be unnecessarily complex for application to general aviation propeller driven aircraft. In developing noise certification levels and procedures for propeller driven small airplanes, the following general principles were observed:

1. Any noise certification scheme for such aircraft should be as simple as possible, in consonance with its ability to produce consistent and reproducible results over the range of ambient test conditions most likely to be encountered in practice.

2. Any selected test procedures should, in principal, be based on the types of normal operation that have evoked complaints from the public.

3. Any proposed noise limits should be achievable by the application of state-of-the-art acoustical knowledge and design principles without imposing undue economic burdens on the manufacturers or operators concerned. At the same time, such limits should challenge designs to produce airplanes substantially less noisy than most of the existing models.

A test program was conducted at the FAA Technical Center near Atlantic City to determine to what extent the Appendix C procedures could be abbreviated and simplified for propeller-driven small airplanes while retaining the elements of technical validity and repeatability to accurately define the noise source. The data recorded during these tests were analyzed using several noise metrics including effective perceived noise level (EPNL), perceived noise level (PNL), A-weighted sound level (dBA) and D-weighted sound level (dBD). As the analyses showed no overriding reasons to utilize more complex measures, dBA was chosen as the basic evaluation measure for general aviation propeller driven aircraft. dBA is also the metric used for other transportation noise sources and for setting noise limits for industrial and community noises.

Data from the tests were also used to appraise the efficacy of using only level flyovers for certification rather than attempting to adjust the three measuring points used for Appendix C certification. Tests of a variety of light airplanes showed that flyovers at both 500' and 1000' produced ample signal to noise ratio. One thousand feet above ground level was chosen as the flyover altitude since it is more representative of the average traffic pattern altitude. The original regulation required the flyovers to be made at maximum continuous power, but, in response to an EPA proposal and to reflect the noise levels to which a community is exposed during normal operation of the aircraft, the test power was changed to require the highest power in the normal operating range. Although the international civil aeronautical organization also adopted the reduced power requirement, several European countries still require the use of maximum continuous power, resulting in a problem for the GA airport manufacturers exporting U.S. aircraft to those contries.

TEST WINDOW

To further ease the burden on those certificating propeller-driven small aircraft, a test window was established within which no corrections are required. Analysis showed that possible difference in atmospheric absorption between the "worst" condition within this window and the acoustic reference day could cause up to 0.4dB deviation. This represents the legitimate advantage an applicant would have if he chose to test under these conditions.

PERFORMANCE CORRECTION

The level flight noise certification procedure prescribed for propeller driven small airplanes does not itself provide the information on the relationship between airplane performance and noise exposure on the ground. For example, two airplanes with the same powerplant would be expected to produce about the same noise level at 1000' over the measuring station, even though the weight of one may be substantially greater than the other. However, a higher performance airplane (greater horsepower to weight ratio) would have the capability of achieving a higher altitude sooner, thus producing less community impact. To compensate for this factor in the simple flyover certification procedures, the rule provides a performance correction methodology which benefits airplanes with good take-off performance and penalizes those with limited performance capability. The correction, which is limited to 5 decibels, is based on allowing the higher performance aircraft to produce the same noise level on the ground as an average aircraft at a point where the average aircraft would reach 1000 ft. This slide illustrates the performance correction methodology to be added algebraically to the level flyover measurements. The resulting noise levels cannot be over 80 dBA for airplanes with a take-off gross weight between 3300# and 12,500# as shown in this slide.

Inherent in each of these noise standards, rules, and advisories, of course, is the strict requirements that any noise control action maintain the highest degree of safety in air travel. Air safety remains the highest priority for the FAA, not only as an operating philosophy, but also as part of the authority which the FAA has in controlling aircraft noise and sonic boom. Section 611 of the Federal Aviation Act specifies that the FAA, in prescribing and amending standards and regulations to control aircraft noise and sonic boom, shall consider that any such actions are consistent with the highest degree of safety in air commerce or air transportation, and are economically reasonable, technologically practicable, and appropriate to the type of equipment to which they will apply.

Nothwithstanding the statutes, regulations and advisories, it is clear that the aircraft noise problem will not be "solved". And, further steps to reduce source-noise levels and manage the airspace for noise abatement purposes are quite limited. It is disarmingly simple to draft still more stringent noise levels for new airplanes, but the technology to meet these limits is not available. It may be that further noise reductions in aircraft designs can only be achieved at the expense of fuel efficiency. In any event, further improvements are some years away.

F

THE GENERAL AVIATION AIRPORT

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FEDERAL AVIATION ADMINISTRATION

THE GENERAL AVIATION AIRPORT

Good morning.

Earlier this morning we heard Bob Lair tell us about the general aviation aircraft fleet as it exists today and some hints about what it will look like in the future. I will spend some time this morning describing the G.A. airport and system of airports to help define the scope of consideration of this G.A. Airport Noise Seminar. I will do this by defining the different classes and activities of G.A. airports and by giving some up-to-date statistics on what the system looks like and the available facilities for G.A. public use.

I realize that describing the G.A. airport and system of airports to most of you is like an FAA Inspector telling a 20,000-hour ATP how to execute an ILS approach, but bear with me while I go through the numbers.

First, let's define the scope of the G.A. airport by defining categories of facility design and use. G.A. airports are split into two basic categories -- Utility and Transport airports.

Utility airports are broken down into three sub-categories -- Basic Utility I and II and General Utility. This airport generally has a runway maximum length of less than 4,000 feet and width of 100 feet or less. The design activity is for all piston aircraft weighing 12,500 pounds or less. This encompasses most recreational, sport, and light business aircraft activity.

Transport airports are divided into Basic Transport I and II and General Transport. Runway lengths vary from 4,000 feet to greater than 10,000 feet and widths from 75 to 150 feet. The runway strengths generally vary from 12,500- to up to 175,000-pound aircraft.

As Bob mentioned earlier, transport aircraft in the upper weight ranges are more accurately defined by use category than by aircraft type. That is, those aircraft in the 175,000-pound category that are not used for Military or Air Carrier purposes are termed "General Aviation" aircraft.

As most of you know, design-wise, you can hardly distinguish between a G.A. Transport airport and an Air Carrier airport. In fact, most Air Carrier airports are basically G.A. Transport airports that happen to be CAB-certificated. I say this because all Air Carrier airports but the very largest -- say, less than 50 -- have more General Aviation aircraft movements than Air Carrier. Therefore, for the purposes of this presentation and the statistics that I will present, all airports this Country except Military and the largest Air Carriers are defined as General Aviation because of G.A.'s predominant activity.

Before I show you the results of some recent number crunching I did using data from the computers of the National Flight Data Center, let's discuss the G.A. airport and how it fits into our national air transportation system.

Most of you have heard of the National Airport System Plan (NASP). Many of you have given it different labels, but we won't go into that, will we? In the NASP, G.A. airports, in addition to Utility and Transport, are further defined based on how they fit into the national airport system. For instance, we have a category called Reliever airports which are metropolitan area G.A. airports which have a system purpose of reducing G.A. activity and hence congestion at predominantly Air Carrier airports. Relievers are generally associated with large and medium hub areas. A Reliever airport can be a Utility or Transport design/use category airport. Historically, Relievers have been given funding and development priority. Therefore, some would say that the Reliever airport is the highest category of G.A. airport. These airports should offer comparable services to an Air Carrier facility; e.g. adequate capacity instrumentation, control towers, etc. At present, there are 164 designated Relievers which have 36,000 based registered civil aircraft (13 percent of the fleet).

Reliever airports, as well as other critical G.A. facilities, must be protected from encroachment by incompatible land uses.

As you will find out in some detail later, existing adjacent noncompatible land uses and potential development of further incompatible use represent the single most critical threat to the efficient use of the G.A. airport facility.

Not all G.A. airports are included in the NASP; only those airports that are deemed critical to the national system of airports. Other airports are considered to be local use only or not essential to the national system. The bottom line on the significance of a NASP airport is that, in the past, no airport could receive Federal funding for development or noise abatement relief unless it was included in the NASP.

Let's look at G.A. NASP airports by design category (See Figure 1). The totals in the above columns indicate the number of NASP locations (airport facilities that the FAA believes to be essential to the overall system). Approximately 75 percent of the civil aircraft fleet are based at the NASP locations.

Now let's broaden our scope to the full G.A. system of airports across this Nation. All of us who fly or ride the G.A. aircraft for either pleasure or business know that a great hindrance to aviation as a transportation mode is not having a landing facility where you want to go (assuming you can afford the AVGAS to get you there). Many times there is an airport nearby, but the old sectional has those fateful letters "PVT" printed next to the little airport indicator. We have all read at one time or other those great press releases that indicate that there are 13,000 plus airports and, although we lose airports every year, we end up with a net gain at years' end because of all those new airports added to the system.

With all those airports available, it's hard to get excited about an airport here or there having its operations somewhat restricted or maybe being abondoned or closed -- unless, of course, it happens to be the airport at which you're based or you need to use regularly.

While thinking about this Conference, and my presentation in particular, I began to wonder what was really available to me or to you in the way of usable G.A. airports.

I had our computer analyst probe the depths of our vast information file to come up with some figures that accurately describe the number of airports actually available to the General Aviation public.

I have several vu-graphs for you to refer to as I go through some G.A. airport statistics. I have broken the airport category down by longest runway length. I have listed the total number of airports by category of longest runway length and by ownership class and availability of use to the public. Of those airports with specific runway length categories that are open to the public, I have included some interesting statistics which indicate the type and level of activity that takes place at these airports (Figures 2 through 4). Total operations and based aircraft are for a 12-month period during 1980-81.

Figure 2. The first category is generally referred to as Basic Utility; those airports with the longest runway at 3,000 feet or less. You should note that there are 8,137 airports in this category; but only 2,321 are available for public use.

Figure 3. Airports with the longest runway greater than or equal to 3,000 feet but less than 4,000 feet are included in the General Utility class airport with a few also included in the Basic Transport Category I. There are 2,833 airports in this category with only 1,898 open to the public.

Figure 4. There are 2,280 airports with the longest runway greater than or equal to 4,000 feet, with 1,903 of them open to the public. These numbers include CAB-certificated airports, and less than 50 have more Air Carrier operations than General Aviation.

In summary, there are a total of 13,250 land based airports, of which only 6,022 are available for public use by General Aviation aircraft. At the

6,022 airports, 120.5 million operations occurred during a 12-month period during 1980-81. There are approximately 174,000 based aircraft, and 1,480 of the 6,022 airports had jet fuel available.

Now that we have the facts on what the existing G.A. airport system consists of, let's look at what the trend has been over the past 6 years (please refer to Figures 5 and 6).

These figures include all these airports, both closed and abandoned through the period shown. Although publicly owned airports had a small net gain, you should note that the net loss of airports "opened to the public" is 453. This represents about a 7 percent reduction in 6 years. This is a trend that, I think we would all agree, should be turned around.

To look at the picture from a different angle, I want to show you the actual abandonments of all airports across the Nation with public and private use for the Years 1979, 1980, and 1981 (Figure 6).

While I'm giving statistics, here are a few more you may find interesting. As of this date, there are 2,200 airports with a published instrument approach, 540 of which have one or more full ILS systems.

I hope you now have an adequate picture of the scope of the G.A. airport system which comprises part of the background to this Conference.

Without exception, I think our common goal is the preservation of G.A. airports.

Until recently, the major cause of airport closings or abandonments has been:

1. Development/economic pressures to use airport land for purposes which produce greater financial gain or increase in tax base.

2. Financial instability of operations (close operating margins).

3. Deteriorating facilities and/or safety conditions.

Of course, these problems are not directly associated with the subject of this Conference, but they nonetheless need to be attacked in a unified manner.

More recently, aircraft noise and incompatible adjacent land uses have added an increasing threat to the efficiency, capacity, and in some cases the very existence of airports. The mention of Westchester County, New York, and Santa Monica, California, immediately brings to mind the gravity of the potential restrictions that the aviation community may face in the near term if we don't continue to face the aircraft noise/land use compatibility problem with openness and cooperation. FAA, in support of that contention and based on the results of an evaluation report to Congress on noise abatement and land use compatibility, recommended in its legislative package that the Aviation Safety and Noise Abatement Act of 1979 be amended to encompass General Aviation as well as Air Carrier airports.

I am, as I'm sure you are, looking forward to the opportunity we both have this week to learn and understand more about the problems we face and some possible solutions to those problems.

Thank you.

PERIOD	BASIC UTILITY	GENERAL UTILITY	BASIC TRANSPORT	GENERAL TRANSPORT	TOTAL
Existing	1378	550	258	19	2,205
5-Yr. Plan	1319	841	380	24	2,564
10-Yr. Plan	1086	190	509	25	2,530

NOTE: The NASP does not categorize reliever, commuter, or CAB-certificated airports as General Aviation airports.

FIGURE 1. GENERAL AVIATION NASP LOCATIONS

	TOTAL	OPEN TO PUBLIC
Privately Owned	7,105	1,387
Publicly Owned	1,032	934
STATISTICS FOR THOSE AIRPORTS "OPEN TO THE PUBLIC"		
Jet Fuel		26
Total Operations		15,522,522
BASED AIRCRAFT		
Single		28,662
Multi		1,609
Jet		1

FIGURE 2. AIRPORTS WITH LONGEST RUNWAY LESS THAN 3,000 FEET

	TOTAL	OPEN TO PUBLIC
Privately Owned	1,263	374
Publicly Owned	1,570	1,524
STATISTICS FOR THOSE AIRPORTS "OPEN TO THE PUBLIC"		
Jet Fuel		360
Total Operations		38,145,353
BASED AIRCRAFT		
Single		47,900
Multi		7,351
Jet		57

FIGURE 3. AIRPORTS WITH LONGEST RUNWAY GREATER THAN OR EQUAL TO 3,000 FEET BUT LESS THAN 4,000 FEET

	TOTAL	OPEN TO PUBLIC
Privately Owned	506	174
Pubicly Owned	1,774	1,729
STATISTICS FOR THOSE AIRPORTS "OPEN TO THE PUBLIC"		
Jet Fuel		1,093
Total Operations		66,891,312
BASED AIRCRAFT		
Single		69,437
Multi		18,221
Jet		502

FIGURE 4. AIRPORTS WITH LONGEST RUNWAY GREATER THAN OR EQUAL TO 4,000 FEET

YEAR	PUBLIC	PRIVATE	TOTAL
1975	3,943	2,494	6,437
1976	3,979	2,414	6,393
1977	3,999	2.335	6,334
1978	4,018	2,276	6,294
1979	4,012	2,109	6,121
1980	3,999	1,985	5,984

FIGURE 5. PREVIOUS YEAR-END FIGURE OF AIRPORTS OPEN TO THE PUBLIC

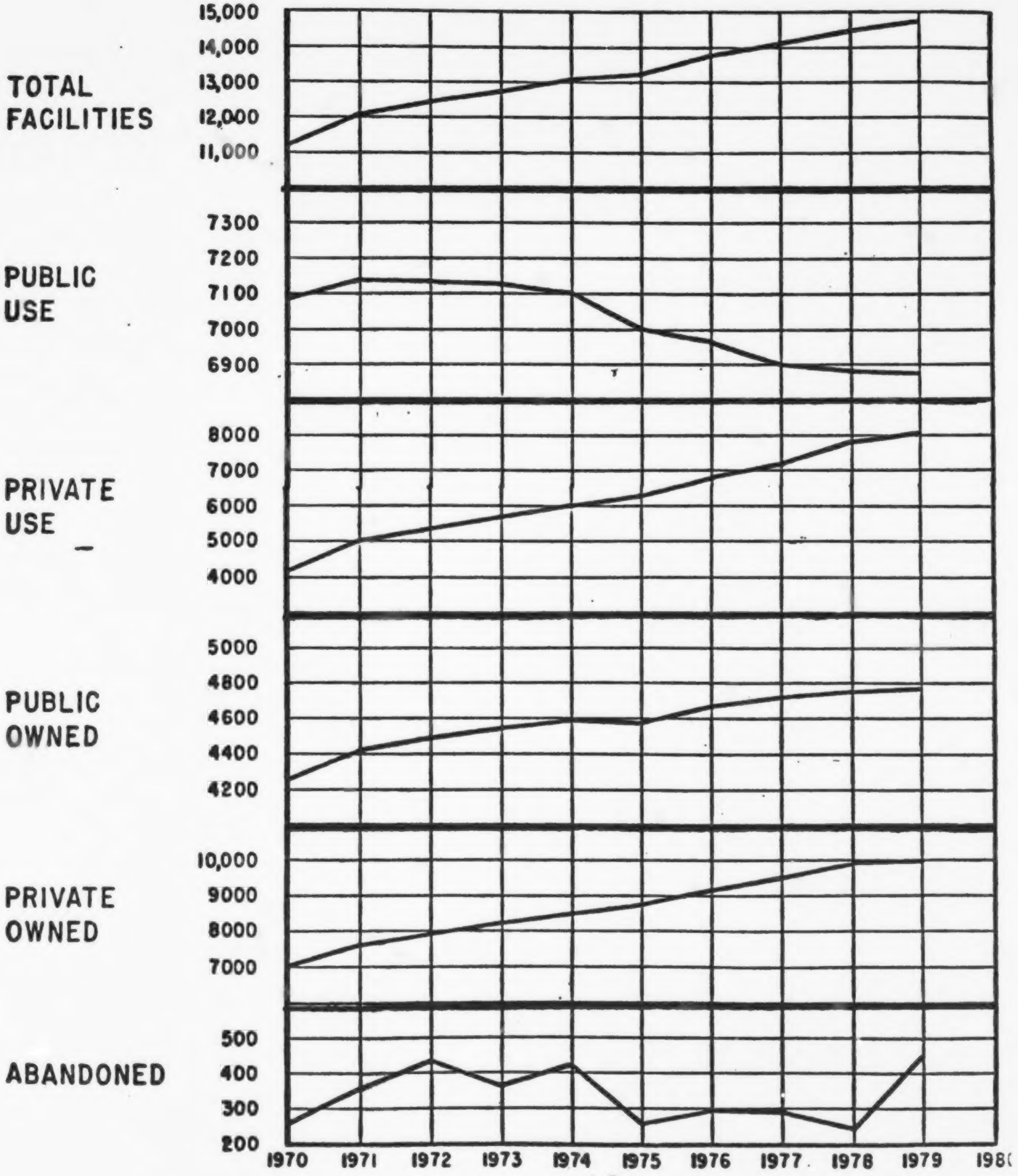
		AIRPORTS WHOSE LONGEST RUNWAY LENGTH IS:		
YEAR	TOTAL	3,000 FEET	3,000 - 4,000 FEET	4,000 FEET
1979	321	267	36	32
1980	240	194	32	14
1981	184*	---	--	--

*63 of which were open to the public.

FIGURE 6. ABANDONMENTS

FIGURE 7

U.S. LANDING FACILITIES



GA AIRPORT NOISE CONTROL PROGRAMS - FAR PART 150

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GA AIRPORT NOISE CONTROL PROGRAMS -
FAR PART 150

INTRODUCTION

1. FAR Part 150, What is It?
2. Why Is It?
3. What Does It Do?
4. How It Can Help:
    a. Airport Operators
    b. Airport Neighbors
    c. Airport Users.
5. How To Do A Part 150 Compatibility Program - A Brief Overview.
6. How To Get Additional Information On The Program.

FAR Part 150, What Is It?

It is a new FAA program designed to:

1. Identify an airport's noise problems
    a. Giving present and future noise contours.
    b. Identifying the noncompatible land uses.
2. Reduce those existing noncompatible uses and prevent additional noncompatible uses via a noise compatibility program.

3. Provide the airport operator with an FAA approved basis for future airport actions related to noise abatement, noise related interactions with local governments, and requests for federal aid.

Why Part 150?

1. Part 150 was developed in implementation of the Aviation Safety and Noise Abatement Act of 1979.
2. It incorporates the experience gained through the ANCLUC program (Airport Noise Control and Land Use Compatibility) and previous noise compatibility programs.
3. It also incorporates the provisions of the Aviation Noise Abatement Policy of 1976.

What Does It Do?

1. Establishes standardized procedures for developing airport noise exposure maps and airport noise compatibility programs.
2. Establishes a single system for measuring airport and background noise. (The A-weighted sound pressure level, or La).
3. Establishes a single system for determining the exposure of individuals to airport noise. (The day-night exposure level, or Ldn).

How It Can Help?

Airport Operators:

1. Resolution of existing noise problems.
2. Protection against future noise problems.
3. An integrated planning and program process with built-in updates.
4. Federal identification of land uses normally compatible with various levels of aviation noise.
5. Provides an FAA approved basis for future airport actions, interactions with local governments, and requests for Federal aid.
6. Possible Federal aid for planning and for program implementation.

How It Can Help?

Airport Neighbors

1. Airport operator consultation with affected local governments and planning agencies during the planning and integral part of the program.
2. Program places equal emphasis upon aviation and land use solutions.
3. Resolution of existing and protection against future noise problems.
4. Federal identification of land uses normally incompatible with various levels of aircraft noise.
5. Possibility of direct Federal aid for program implementation.
6. Built-in program review and up-date provision.

How It Can Help?

Airport Users

1. Resolution of existing and protection against future noise conflicts.
2. Consultations with airport users during the planning and integral part of the program.
3. Balanced mix of aviation and land use solutions.
4. FAA review of program proposals - including those affecting operations.

How To Do A Part 150 Compatibility Program - A Brief Overview

1. Program consists of two distinct parts -
   - a. The airport noise exposure map.
   - b. The airport noise compatibility program.
2. The noise exposure map -
   - a. Provides noise and other data for the compatibility program.
   - b. Must have FAA approval prior to any review of the program.
3. The noise compatibility program -
   - a. Uses map as input.
   - b. Explores a wide range of alternatives to find the best solution.
   - c. Provides for consultation with all those likely to be affected.
   - d. Provides for implementation.
   - e. Provides for periodic review and update.

The Noise Exposure Map

1. Identify the noncompatible land uses as of the date of submission:
    a. Show the Ldn 65, 70 and 75 (developed via INM).
    b. Show noncompatible land uses (per Table 2, Part 250).
2. Describe the aircraft operations for 1985 (or for 5 years hence if submitted after 1982).
3. Describe the nature and extent that such operations will affect land uses.
4. Prepare map in consultation within:
    a. Local governments and planning agencies with Ldn 65.
    b. Air carriers (for air carrier airports).
    c. Other aircraft operators using airport.
5. Provide ample opportunity for public review and comment during map development.
6. Follow the other requirements of Part 150 and its Appendix A.
7. Certify the map and data as true and complete.

The Noise Compatibility Program

1. Develop the program in consultation with the governments and planning agencies within the Ldn 65 contour, plus airport users.
2. Use the inputs and data from:
    a. Noise exposure map and its supporting data.

    b. The local governments and planners, plus the airport users.

3. Develop a series of alternative solutions which:
    a. Reduce existing noncompatible uses.
    b. Prevent additional noncompatible uses.
    c. Do not impose an undue burden on interstate or foreign commerce.
    d. Provide for periodic review and update.
4. Both aviation and land use solutions should be pursued and with equal vigor.
5. Each solution should include implementation.
6. Weight the costs and benefits of each alternative including:
    a. Any concentration of costs upon relatively small groups of individuals or users.
    b. Possible impacts upon interstate or foreign commerce.
7. Select the most viable alternative and develop it into a full program.
8. Make provisions for periodic review and update.
9. Follow the other requirements of Part 150 and its Appendix A for programs.
10. Submit to FAA regional office and to FAA director of environment and energy in Washington.

How To Get Additional Information on the Part 150 Program

1. Contact your FAA airports district office.
2. Contact your FAA regional office.

3. Contact the FAA Noise Policy and Regulatory Branch in Washington, (202) 755-9027 or write:

Federal Aviation Administration
Attention: AEE-110
800 Independence Ave., S.W.
Washington, D.C. 20591.

Comments on FAR Part 150

On or before December 31, 1981

Federal Aviation Administration
Office of the Chief Counsel
Attention: Rules Docket (AGC-204)
Docket No. 16279
800 Independence Avenue, S.W.
Washington, D.C. 20591.

GENERAL AVIATION NOISE IMPACT BEYOND THE AIRPORT BOUNDARY FROM 1975 TO 2000

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GENERAL AVIATION NOISE IMPACT BEYOND THE AIRPORT BOUNDARY FROM 1975 TO 2000

INTRODUCTION

This presentation is in three parts. First, some notes on public reactions to aircraft noise at levels encountered around general aviation airports. Then an analysis of the noise exposure levels predicted in areas near GA airports in general in the period 1975 to 2000. Then an analysis of GA aircraft noise around a few airports with a relatively high percentage of GA jet operations.

EFFECTS ON GENERAL AVIATION NOISE ON PEOPLE

The EPA has determined that no adverse effects on health or welfare of noise exposure would be expected at levels below L_{dn} 55. 65 L_{dn} has been established as the limit of noise exposure normally acceptable in residential areas near air carrier airports. However, we are aware of noise problems at airports where the exposure levels are between 55 and 65 L_{dn}. In areas of low ambient noise the noise from general aviation aircraft is more intrusive. The more audible a sound is the more annoying it is to most people. Thus, it is not unreasonable to expect the noise from the same aircraft would cause greater annoyance at some airports than at others. General aviation airports are usually located in areas more remote from noisy urban centers than air carrier airports and are therefore more likely to have noise problems in 55 to 65 L_{dn} noise exposure areas.

There is considerable variability in the percentages of communities highly annoyed by aircraft noise in this 55 to 65 L_{dn} range.

Although there are perceptible differences between air carrier noise and general aviation noise, the difference in community reaction between the two may, in large part, depend on the specifics of individual cases; how much the community has available from, or consciously depends on, the general aviation airport for emergency transportation services, tourism, operation of local industries, and other economic support; whether the community is considering alternative uses for the airport's land; whether the local government supports the airport; and so on.

Another consideration which may determine the percent highly annoyed is the relationship of GA aircraft noise to other community problems. In a Utopian community with no other problems, 10 percent highly annoyed by general aviation aircraft noise might be a problem of major significance. In a community beset by crime, high taxes, unemployment and other ills, the fact of 10 percent highly annoyed by some other source may be inconsequential.

Although some details of community reaction to general aviation noise have not yet been explored, the general picture is clear. The major effect of general aviation noise on airport communities is annoyance. This annoyance is related to exposure levels, and at low exposure levels, it is also related to factors other than noise. The way an airport deals with these non-physical factors can influence the degree of annoyance and the manner in which it is expressed.

A final caution about predicting community response to general aviation noise is that some uncertainty still remains about health and welfare effects in the range of 55 to 65 L_{dn}. Although some people may have intuitive concern about effects of low level noise exposure on people, there is as yet no firm scientific evidence for or against such potential effects. The use of existing relationships for annoyance should thus be considered as an expedient until more definitive information becomes available.

EXPOSURE TO GA NOISE

This is a study of the areas and the people exposed to general aviation aircraft noise. The study is in two parts.

1. An analysis of GA aircraft noise at GA and commuter airports using a mix of small propeller and business jet aircraft at airports that is representative to their use at these airports.
2. An analysis of the GA aircraft noise impact at a few airports where the fleet mix is appreciably different from the average and/or the number of operations is higher than the average.

Part I

The data for aircraft operations and aircraft types have been taken from the statistics presented in the 1980 FAA National Airport System Plan and the FAA Census of U.S. Civil Aircraft for the calendar year 1979. This latter document has an accurate listing of all registered aircraft in the U.S. by type and by county of registry. The CAB provides statistics on air carrier operations by airport and aircraft type but there is no similar source of information for GA aircraft operations. A statistical analysis was therefore made of the operations of GA propeller and jet type aircraft at the GA commuter airports in a ten state survey and the results extrapolated to the U.S. as a whole. A generalized fleet mix of aircraft and number of operations as a function of based aircraft was developed for three classes of airports. These are:

a. Basic utility airports with less than 3200 foot runways serving small propeller aircraft only.

b. General utility airports with runway lengths between 3200 and 4300 feet serving essentially propeller aircraft only.

c. Transport airports with runways longer than 4300 feet serving GA and commuter propeller and jet aircraft.

Ldn contours and areas within these contours were computed for a matrix of aircraft types and numbers of operations. From these data, formulas were developed which would predict the areas within the 55, 60 and 65 Ldn contours in terms of the aircraft mix and number of operations at these airport.

The area of the airport was also predicted as a function of runway length and based aircraft. The airport area was then subtracted from the areas within the contours to obtain net area. This makes the area within the 65 Ldn contours quite sensitive to number of operations since the net contour area is zero until the contour projects beyond the airport boundary. Then it increases rapidly.

A prediction of changes in the jet fleet mix shown in Table 1 aircraft noise was made based on the assumption that the inefficiency of the older jets relative to newer types coming on the market would cause them to be scrapped, the oldest during the 80's and others during the 90's. Numbers of operations through 1990 predicted in the National Airport System Plan were used and this growth curve was extended to 2000. The areas within the 55, 60 and 65 Ldn contours were then calculated for the years 1975 through 2000 using a mixture of 98 percent propeller aircraft and 2 percent jets because that is the average ratio of props vs jets in the fleet. The following curves show the area changes based on these calculations.

Figure 1 for Basic and General Utility Airports shows the increase in 55 and 60 Ldn areas as a function of increased numbers and sizes of aircraft with time for the 771 airports in the sample which was analyzed. The noise produced by these aircraft is not expected to change significantly during this period.

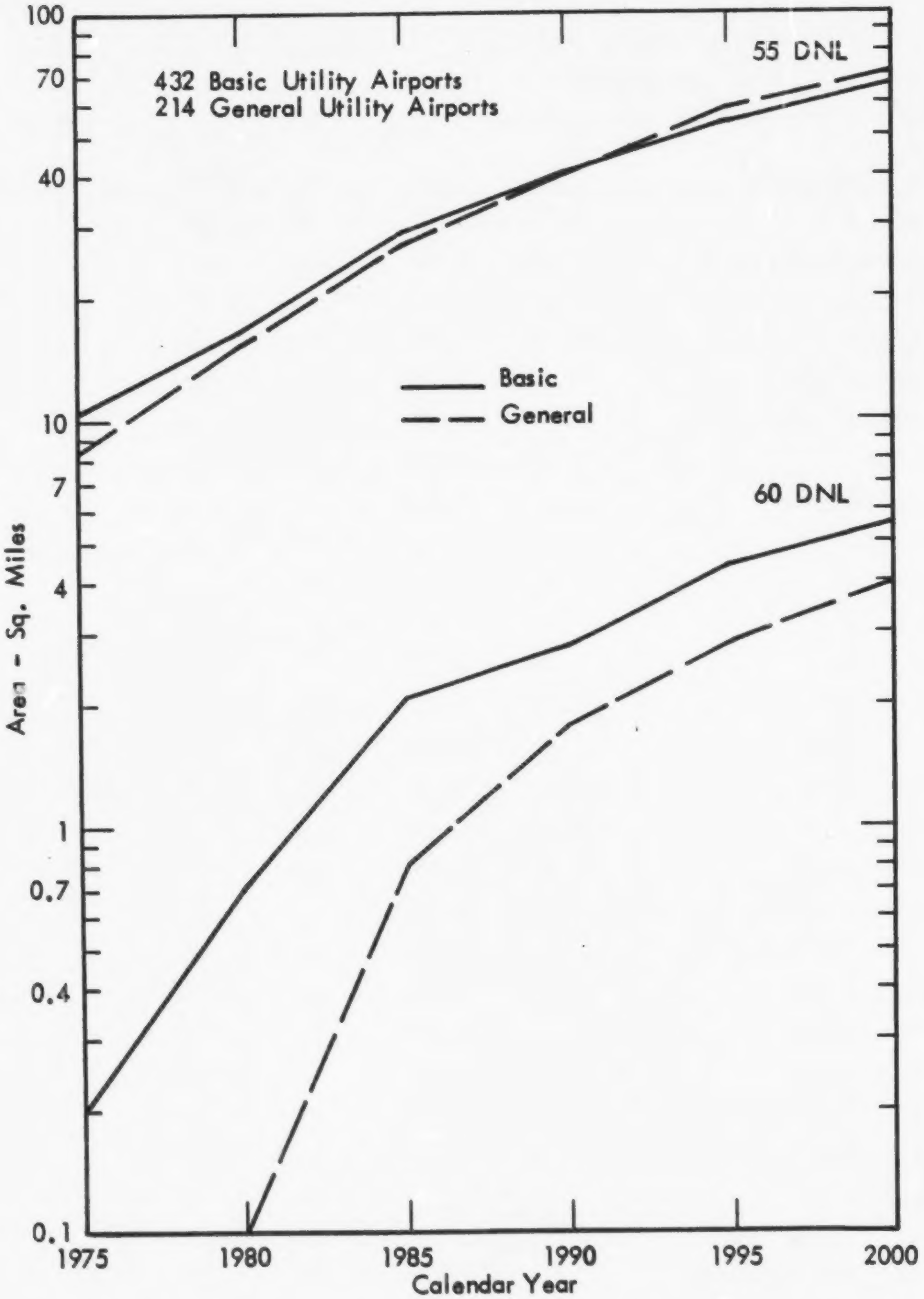
F

TABLE 1

BUSINESS JET FLEET PROJECTIONS
FRACTION BY AIRCRAFT MODEL

Airplane	Percent of Total					
	1975	1980	1985	1990	1995*	2000*
Citation I & II	9.76	20.21	20.48	22.54	35	35
Commander 1121/1123	9.63	5.01	2.39			
Falcon 10	1.13	4.31	7.01	7.72		
Falcon 20	12.82	7.53	5.02	3.60		
Gulfstream II	8.83	6.83	4.67	2.46		
Gulfstream III		0.39	2.99	3.95	4	0
Hansa 320	0.80	0.56	0.24			
HS-125-400/600	10.11	6.48				
HS-125-700		0.95	3.83	3.51		
Jetstar I	7.91	2.80	0.60			
Jetstar II		2.59	3.11	1.75		
Learjet 23	4.85	2.38				
Learjet 24	10.03	7.00	3.59			
Learjet 25-29	8.57	8.26	4.19			
Learjet 35/36	0.33	10.08	12.51	14.74	41	40
M-S Paris	0.73	0.39	0.19			
Sabreliner 40	7.65	4.03	1.91			
Sabreliner 60/70	5.97	4.31	2.03			
Sabreliner 65A		0.91	1.79	1.32		
Sabreliner 75A	1.53	1.93	1.32	0.88		
Westwind 1124		2.24	2.25	1.75		
Challenger 600		0.21	3.83	6.67	20	25
Citation III			4.43	7.37		
Corvette SN601			0.29	0.14		
Falcon 50			2.39	3.51		
Learjet 50			2.89	6.14		
Sabre/HS conversions			2.39	1.75		
New designs			4.14	10.21		
Total	1504	2857	4180	5700	7300	8925

*1995 and 2000 forecasts are by engine type only. The specific airplanes identified are considered generic of the engine type.



CUMULATIVE DNL AREA OUTSIDE UTILITY AIRPORTS

FIGURE 1

Figure 2 shows the changes with time for transport airports, and Figure 3 shows the total changes with time through the year 2000 using this approach. These areas are multiplied by three for the total number of airports in the U.S.

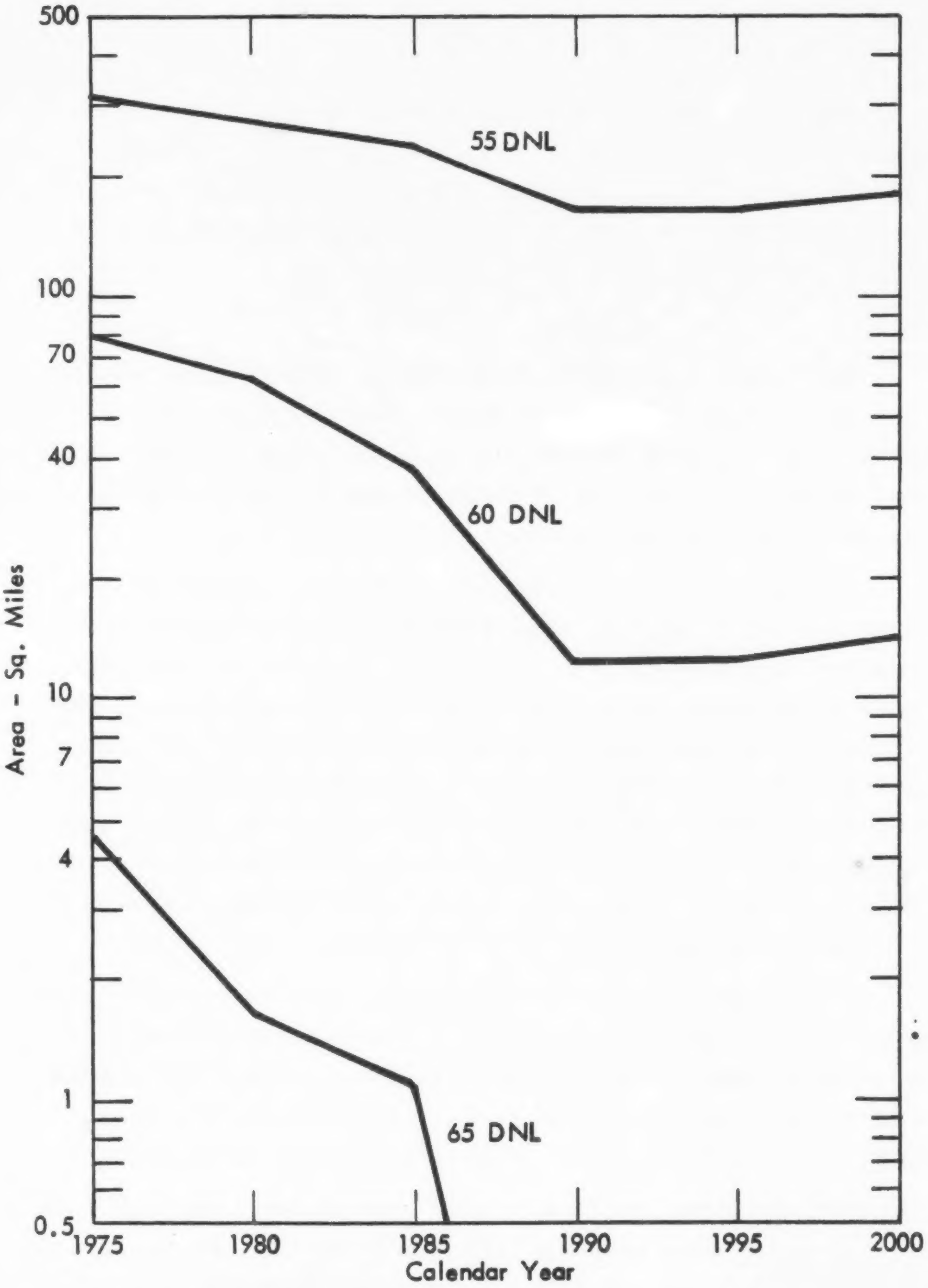
Part II

The results shown in these three charts must be used with caution. They were constructed using a broad brush treatment, i.e., assuming numbers of operations in proportion to based aircraft, fleet mix based on runway length and 2% jets at all transport airports.

A quick check of airports which were listed in the census as having a larger than average number of based jets was made and the areas above 55, 60 and 65 Ldn for the year 2000 were calculated on the same basis as above but with the percentage of jet operations based on percent of based jets rather than the 2% across the board as used above. Ten airports were selected where the 65 Ldn contour came to or outside the boundary of the airport. These were GA airports and air carrier airports where the air carrier operations were zero or small, compared with GA operations.

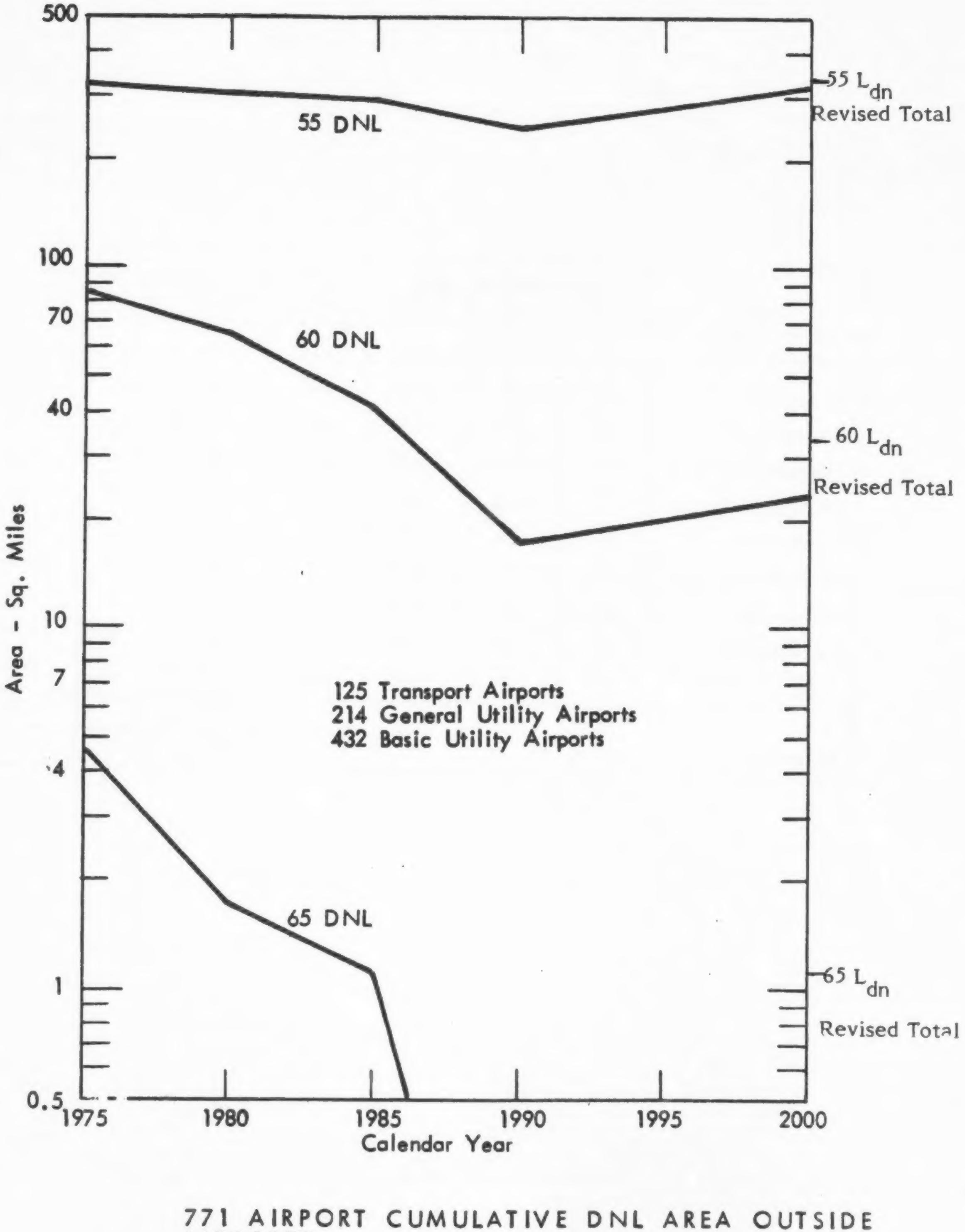
The areas within the 55, 60 and 65 Ldn contours for the year 2000 are shown in Table 2. The earlier years were not calculated because empirical data on area vs. operations and percent jets were not available. Obviously, the area within the 65 Ldn contour in earlier years was also higher.

The areas within the 55, 60 and 65 Ldn contours for 33 airports where the percent jets was more than 2% are also shown in Table 2. The 65 Ldn area did not incraase beyond that for the 10 additional airports. The 60 Ldn area for the 33 airports is 41 mi^2 and the 55 Ldn area os 161 mi^2. If the 33 airports are the only ones of the 125 that are above 2%



125 TRANSPORT AIRPORTS - CUMULATIVE DNL
AREA OUTSIDE AIRPORTS
MIXED FLEET - 2% JETS

FIGURE 2



771 AIRPORT CUMULATIVE DNL AREA OUTSIDE AIRPORTS

FIGURE 3

TABLE 2
L_{dn} Areas at Selected Airports

Airport	Based Aircraft, 1979			1979	Net Area, mi^2, 2000		
	Total	Jets	% Jets	Ops/Day	65 Ldn	60 Ldn	55 Ldn
Fortworth, TX	228	17	7.46	918	0.20	2.25	1.55
Dover, DE	34	20	58.82	132	0.01	0.94	3.02
Bridgeport, CT	200	33	16.5	540	0.16	1.84	5.86
Houston, Hobby, TX	600	130	21.7	926	0.72	3.47	9.90
Wilmington, DE	117	65	55.6	559	1.11	3.65	9.35
Lincoln, NE	165	26	15.8	532	0.16	1.81	5.73
Santa Anna, CA	950	64	6.74	1775	0.62	3.75	11.61
Wichita, KA	251	39	15.5	704	0.34	2.36	7.21
Rochester, NY	131	9	6.87	685	0.00	1.58	5.72
Tulsa, Jones, OK	256	32	12.5	608	0.06	1.74	5.84
	Totals				3.18	23.39	71.79
33 Airports	**Totals**				3.2	41.1	161.2

in jet operations, we can just replace about 33/125 of the 60 and 55 Ldn transport airport areas with 1/3 of the areas for the 33 airports. The totals are then 34 and 327 mi^2 respectively as indicated on the margin of Figure 3.

The total areas and populations within the contours calculated for 55, 60 and 65 Ldn for 1975 and 2000 are obtained by multiplying the numbers for the 771 airport sample by 3.

	Areas in mi^2		Population	
	1975	2000	1975	2000
55 Ldn	925	981	1,256,000	1,600,000
60 Ldn	225	102	363,000	500,000
65 Ldn	14	3.3	47,000	11,000

Summary

As would be expected the areas within the 65 Ldn contours are relatively small and the areas within the 55 Ldn contours are relatively large, in this analysis based on overall numbers of operations rather than counts by aircraft types at each airport an estimate of the magnitude of the area and populations exposed to 55, 60 and 65 Ldn are presented.

It is pointed out that although there is a relatively small total area exposed to 65 Ldn or greater it is significant at some airports today and will even be a factor in the year 2000, when the jet fleet noise level is predicted to be reduced by about 15 dB.

The 60 and 55 Ldn areas which produce considerable community negative reaction near some GA airports are large. They are predicted to contain 500,000 and 1,600,000 people respectively.

While these numbers indicate the overall dimensions of the problem the situation at a given GA, or air carrier airport with predominentely GA operations, must be analyzed on the basis of its site specific layout and its present and predicted fleet mix and numbers of operations.

PROGRESS IN DESIGN METHODS FOR REDUCING NOISE OF GENERAL AVIATION AIRCRAFT

JOHN P. RANEY
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PROGRESS IN DESIGN METHODS FOR REDUCING NOISE OF GENERAL AVIATION AIRCRAFT

SUMMARY

In this paper, the elements of aircraft noise prediction with application to preliminary design and parametric studies of general aviation aircraft systems are introduced and discussed. Noise reduction technology applicable to general aviation aircraft is identified. Several examples of noise prediction for jet-powered aircraft are presented. Noise prediction and design-for-noise methodology for propeller-driven aircraft are also discussed.

SYMBOLS

A	atmospheric propagation effects factor
C_a	ambient speed of sound, m/sec
G	ground effects factor
H	altitude, m
I	source intensity, watt/m^2
P	acoustic pressure, N/m^2
r	noise propagation vector w.r.t. body axes
R	relative spectrum factor
t	time, sec
θ	source directivity angle, deg
ϕ	source azimuth angle, deg

Subscript

o	observer

ABBREVIATIONS AND SPECIAL SYMBOLS

ANOPP	Aircraft Noise Prediction Program
CTOL	conventional takeoff and landing
(C_L/C_D)	lift-drag ratio
$\langle P^2 \rangle$	mean squared pressure
SST	Supersonic Transport
$(T/\dot{m}c_a)$	normalized specific thrust
(T/W)	thrust-weight ratio

INTRODUCTION

Aircraft noise is a serious problem in many airport communities. The Federal Aviation Administration (FAA) requires that all conventional take off and landing (CTOL) aircraft, whether jet-powered or propeller-driven, satisfy very specific noise certification requirements published in Federal Air Regulation (FAR) Part 36 (Ref. 1). Furthermore, airport operators may impose operational restrictions in an effort to reduce community noise exposure (Ref. 2).

The aircraft designer requires accurate design methodology (Ref. 3) to assure that new aircraft will meet the FAR 36 requirements. Aircraft operators require methods to satisfy noise criteria imposed by individual airport operators. Airport operators require methodology to establish nondiscriminatory rules for assuring airport noise levels acceptable to the neighboring community.

General aviation aircraft contribute in varying degree to airport noise. For example, at air carrier certified airports the noise contribution of general aviation aircraft may be minimal or totally insignificant. On the other hand, at non air carrier-certified airports, which are generally referred to as general aviation airports, all of the noise is generated by general aviation aircraft. At all events, noise reduction is a concern of all elements of the general aviation aircraft community.

The purpose of this paper is to discuss the present state of the art of design-for-noise methodology applicable to both jet and propeller driven general aviation aircraft. Specific noise reduction technology will be identified.

DESIGN FOR NOISE

In order to perform parametric studies to determine the minimum achievable noise levels at the three specific locations required by FAR 36, (approach, sideline during takeoff, and takeoff flyover for aircraft of greater than 12,500 pounds gross weight and maximum continuous power flyover at 1,000 feet for aircraft of less than 12,500 pounds gross weight), a model is required which incorporates the elements of propulsion, aerodynamics, and noise shown in dimensionless form in figure 1. The thrust - weight ratio, (T/W), sizes the propulsion system, the lift-drag ratio, (C_L/C_D), represents the aircraft's aerodynamic characteristics, and the normalized specific thrust, $(T/\dot{m}C_a)$, is an indicator of source noise.

The essential ingredients of the aircraft noise prediction problem (for either parametric or point design studies) are indicated in figure 2: (1) the source noise intensity I, (2) the aircraft position given by the vector R(t), (3) the aircraft orientation given by θ and ϕ, (4) the atmospheric and ground impedance characteristics given by A and G, and (5) the location of the observer given by the vector r(t). Noise at the observer is indicated by mean square pressure, $\langle P_0{}^2 \rangle$.

The essence of figures 1 and 2 is that to properly evaluate the noise level at a particular point on the ground and to perform parametric studies leading to a satisfactory compromise between noise and performance requires a relatively sophisticated computer implementation of the relationships inherent in the physics of propulsion, aerodynamics, aircraft stability and control, aircraft propulsion systems and aerodynamic noise, and atmospheric propagation and ground effects. These ingredients have been incorporated in NASA's Aircraft Noise Prediction Program (ANOPP) as illustrated in figure 3 (Ref. 4).

ANOPP represents a state-of-the-art capability for the calculation of the noise generated by CTOL aircraft (ref. 5). Modules are included for calculating the intensity, frequency content, and directivity of noise radiated by a moving jet-powered aircraft. The effects of propagation are provided by additional modules together with the capability to calculate, from the mean square pressure time histories at arbitrary locations, one-third-octave spectra time histories and, hence, noise levels in terms of any desired noise metric. A contouring capability completes the package.

ANOPP provides the capability to perform both detailed point design studies and parametric analyses. The first application of ANOPP was in an international study of supersonic transport (SST) noise levels (ref. 6). Since that time ANOPP has been under continuous development and improvement with extension to high bypass-ratio-powered wide-body aircraft validation studies (refs. 7, 8. 9). The addition of the propeller prediction capability described in reference 10 is well underway.

GENERAL AVIATION NOISE REDUCTION TECHNOLOGY

General aviation aircraft include single engine propeller-driven, large propeller-driven commuter, and jet-powered business aircraft. Fortunately noise reduction technology is available for every class of general aviation aircraft. For example, a recently completed research program resulted in demonstrating significant noise reduction for a light propeller aircraft (ref. 11,12). Competing propeller designs were wind tunnel tested for performance and noise. Final full-scale flight test evaluation resulted in an average of 5 dB(A) noise reduction for 1,000 ft full power flyover with no appreciable effect on performance. The performance, aerodynamic, and noise prediction algorithms employed in this study are applicable to the complete range of propeller driven aircraft and can be employed to design minimum noise propellers for given performance requirements (Ref. 11). The design process as applied in the form of stand-alone computer codes is outlined in figure 4. ANOPP modules presently under development are indicated in figure 5. Some of the variables considered are blade radius, number of blades, tip speed, tip thickness, airfoil section, and loading distribution. While it is well known that reduced blade loading and lower tip speed individually result in reduced noise, the application of sophisticated analytical models is required to identify minimum noise propeller designs that also achieve satisfactory levels of performance.

A similar noise reduction situation exists for jet powered business aircraft. Source noise reduction may be accomplished by installation of acoustic duct liners and by lower jet velocity achieved through high-bypass-ratio engines. Jet noise suppressors are also availble.

Operational procedures are often suggested as a means of reducing noise. For example, during the design process additional power may be considered to permit greater latitude in selection of climb and cutback strategies to reduce the noise at the certification points specified by FAR 36. Or, for existing aircraft, the noise levels at specified locations may be reduced or minimized by selecting an appropriate flight path (Ref. 13). A comprehensive summary of aircraft noise control technology available in the 1980's is presented in reference 14.

In order to achieve the proper balance of all parameters in an aircraft design that meets all design constraints placed on cost, performance, and noise, whatever the combination of source noise reduction and operational procedures to be considered, a complete systems analysis capability is required.

SOME EXAMPLES OF NOISE PREDICTION FOR GENERAL AVIATION AIRCRAFT

The following examples help to quantify the accuracy of available noise prediction methods to identify areas needing further improvement, and to indicate existing potential for noise reduction of general aviation aircraft.

Jet Powered Business Aircraft

The first two of the following examples were analyzed using the capability presently incorporated in ANOPP (ref. 5). In both cases the measured data were supplied by manufacturers who conducted the flyover noise tests and supplied estimates of nominal values of the engine parameters which are input to the noise prediction methodology. The third case, QCGAT,illustrates potential noise reduction available through application of modern high-bypass-ratio jet engine technology to general aviation business jets.

Gulfstream II.- A comparison of measured flyover noise levels are compared with predicted levels for the Gulfstream II in figure 6. A comparison of measured and calculated perceived noise level (PNL) versus directivity angle, θ, is shown on the left portion of the figure. A comparison of measured and calculated frequency spectra at maximum PNL is shown on the right portion of the figure. The agreement is very good. Effective perceived noise levels, (EPNL), agreed to within 1 dB.

Learjet.- A comparison, in the same format as figure 6, of measured and calculated noise levels for a Learjet aircraft is given in figure 7. Again, the agreement is very good indicating that the methodology for calculating noise levels of turbojet powered aircraft is satisfactory.

QCGAT.- The Quiet Clean General Aviation Turbofan (QCGAT) engine and aircraft propulsion system project was undertaken by NASA to demonstrate the noise reduction available for an engine in the 7000N (1600 lbf) class through application of large turbofan engine technology. In the present example reported by Avco Lycoming in reference 15, the engine design was based on the LTS-101 engine family for the core engine and incorporated a high-bypass-ratio fan design (BPR = 9.4). A comparison of predicted noise level with static test results is shown in figure 8. (The prediction methods employed were those implemented in ANOPP but actually used by AVCO Lycoming as stand alone programs.)

Based upon good agreement of predicted static engine test with acoustic levels, the FAR-36 certification noise levels were calculated for comparison with project design goals as shown in figure 9. Design noise goals were exceeded for all three FAR-36 certification points. Performance goals were not actually met by the engine configuration actually tested but are believed achievable by hardware built to QCGAT specification.

Propeller Driven General Aviation Aircraft

The following examples were analyzed using the noise prediction capability that will be installed in ANOPP in the near future. Except for the MIT Cessna 172, propeller performance was not addressed.

MIT Cessna 172.- Results of the MIT quiet propeller design validation study (refs. 11, 12) are shown in figures 10 and 11. The quiet propeller was characterized by longer chord, thinner tips, and slightly smaller diameter than the baseline propeller. As shown in figure 10 the climb performance of the aircraft equipped with the quiet propeller was very near to that delivered by the baseline propeller. A comparison of noise levels is given in figure 11 where it can be seen that the MIT propeller is nearly 5 dB(A) superior to the baseline propeller as measured against both power and true airspeed.

Twin Otter.- A comparison of the measured and of the combined calculated thickness and loading noise levels for a Twin Otter aircraft is shown in figure 12. The calculated amplitudes of the first several harmonics are plotted as solid circles on the measured narrow band frequency spectrum. The good agreement obtained suggests that the above method is useful for making predictions as well as for parametric studies for acoustic evaluation of changes in geometry and/or operating conditions.

Commander 1000.- Results for the Gulfstream Commander 1000 are shown in figure 13. In this figure measurements made in the near field using a boom-mounted microphone are compared with calculated results. The first six harmonics are well predicted and, except for some effects of fuselage reflection, the measured and calculated pressure time histories are in good agreement. A complete data set of near field and far field (ground) measurements for this aircraft will soon be available for more extensive validation of analytical methods.[1]

---

[1] The experimental results were obtained by the Ohio State University under contract to the NASA Lewis and Langley Research Centers.

CONCLUDING REMARKS

The present methodology for calculating the noise produced by jet-powered general aviation aircraft and for performing parametric studies is quite good although manufacturers would benefit from greater accuracy manifested in narrowing of noise design margins. Noise reduction technology has been at least partially demonstrated by the QCGAT program.

Although more work remains to be accomplished, the present capability to design quiet, efficient propellers has been demonstrated for light aircraft. Application to heavier propeller driven aircraft should be relatively straightforward. All of the requisite technology is already in the public domain and available to industry.

The application of modern design-for-noise methodology and the implementation of noise reduction technology by the general aviation industry will ultimately be driven by government regulations on the one hand and customer-specified criteria on the other.

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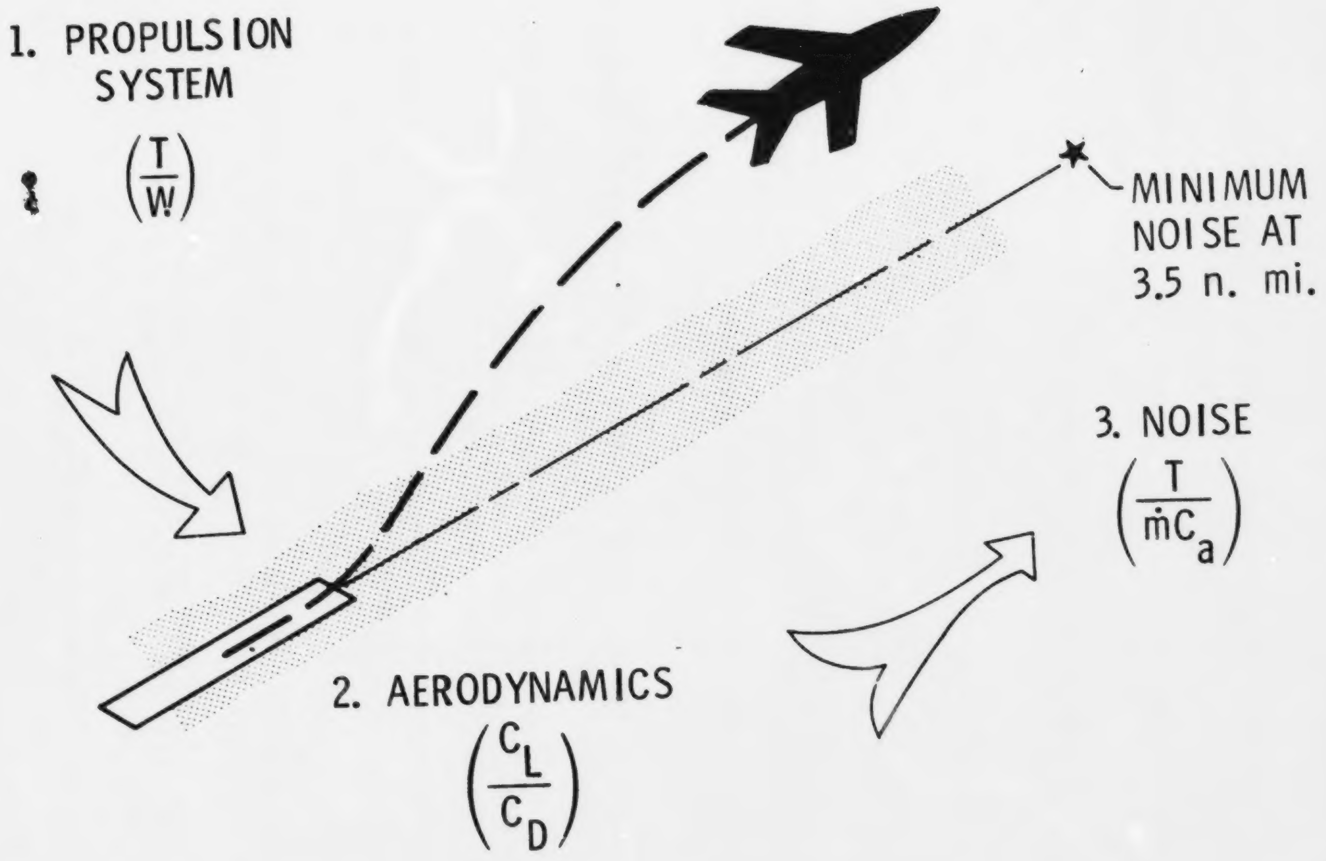
1. PROPULSION SYSTEM
$\left(\frac{T}{W}\right)$
MINIMUM NOISE AT 3.5 n. mi.
3. NOISE
$\left(\frac{T}{\dot{m}C_a}\right)$
2. AERODYNAMICS
$\left(\frac{C_L}{C_D}\right)$

Figure 1.- Preliminary systems design studies.

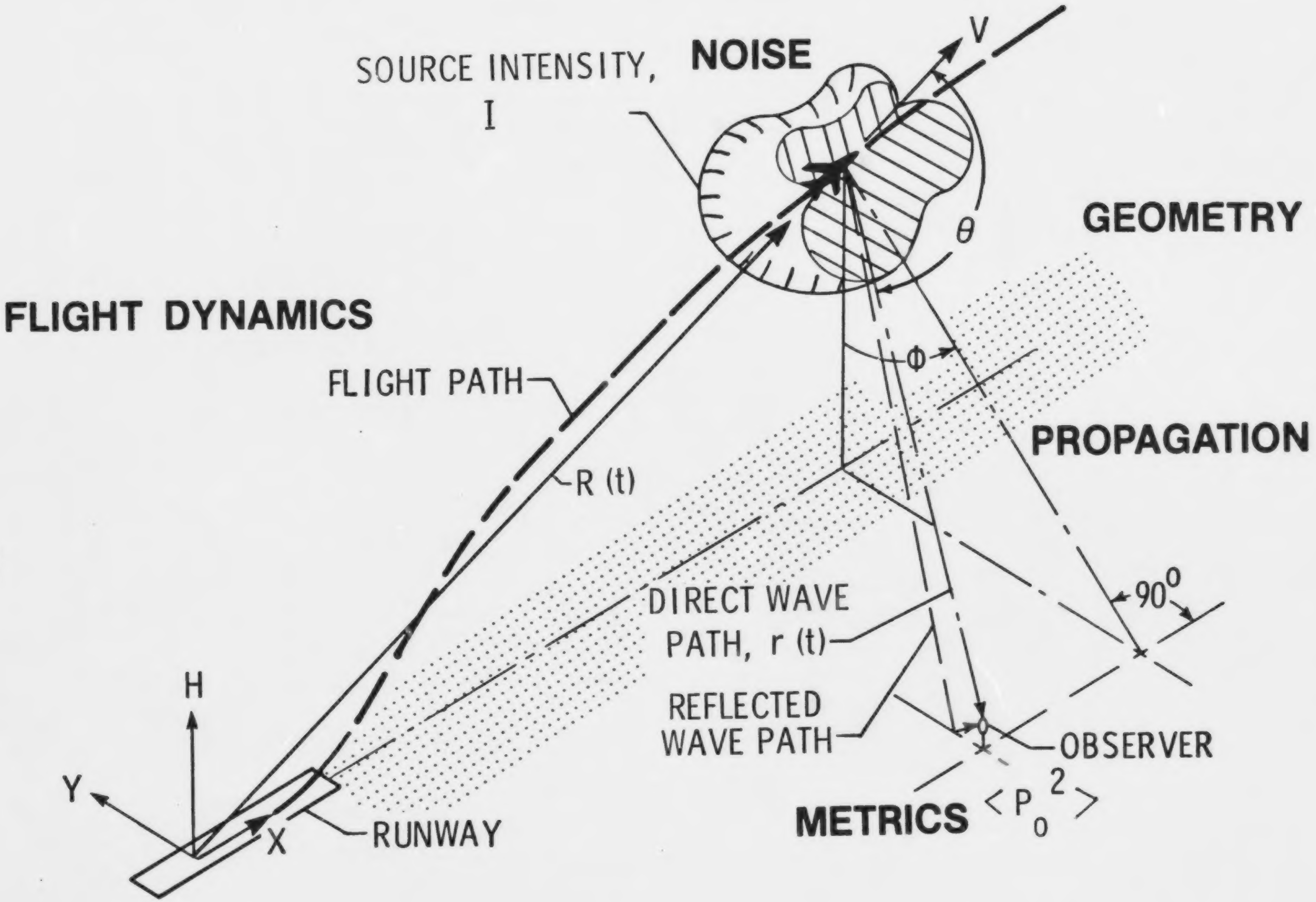
SOURCE INTENSITY,
I
NOISE
V
θ
GEOMETRY
FLIGHT DYNAMICS
FLIGHT PATH
Φ
PROPAGATION
R (t)
DIRECT WAVE
PATH, r (t)
90^0
H
REFLECTED
WAVE PATH
OBSERVER
Y
X
RUNWAY
METRICS $\langle P_0^2 \rangle$

Figure 2.- Aircraft noise prediction model.

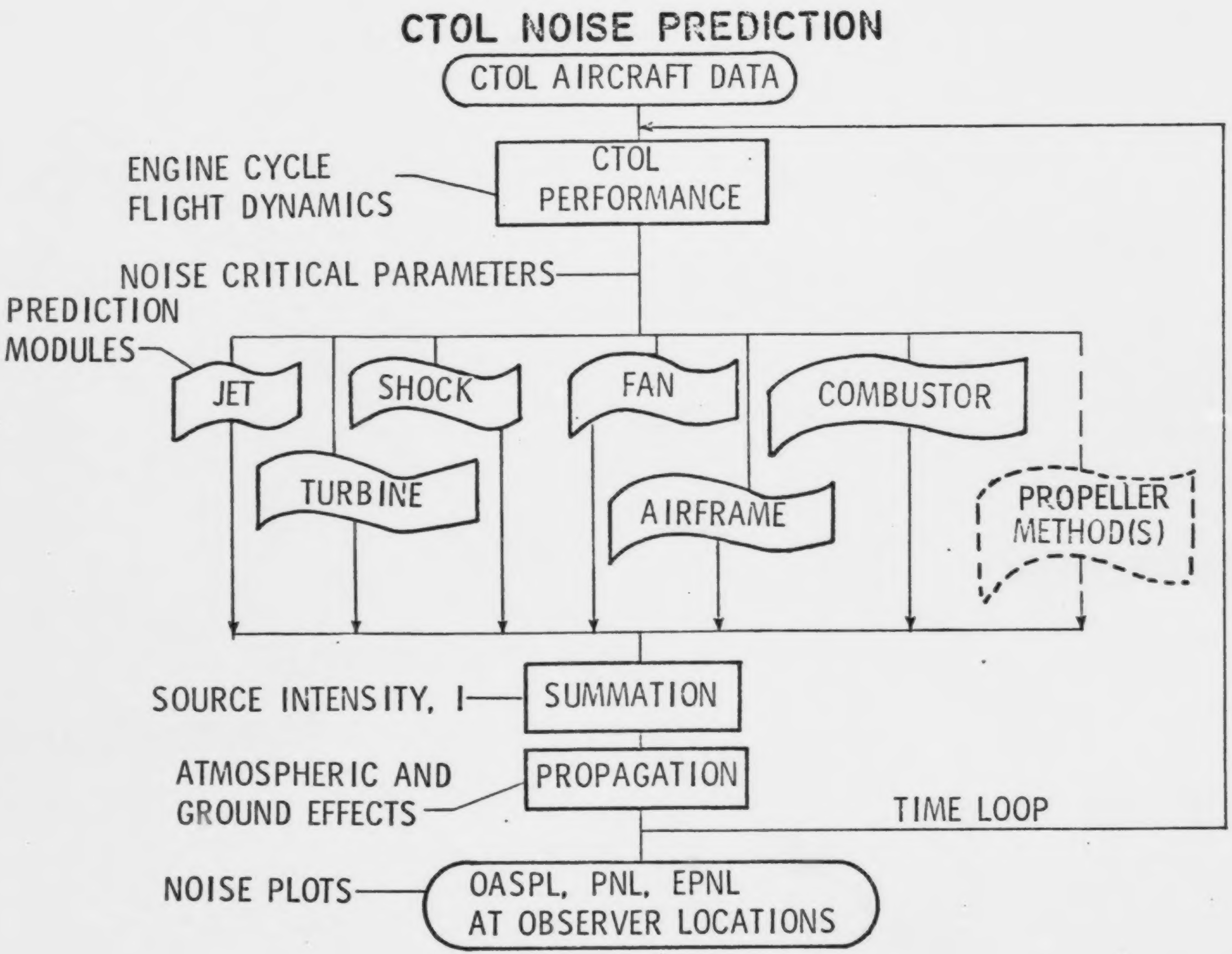
CTOL NOISE PREDICTION
CTOL AIRCRAFT DATA
ENGINE CYCLE
FLIGHT DYNAMICS
CTOL
PERFORMANCE
NOISE CRITICAL PARAMETERS
PREDICTION
MODULES
JET
SHOCK
FAN
COMBUSTOR
TURBINE
AIRFRAME
PROPELLER
METHOD(S)
SOURCE INTENSITY, I
SUMMATION
ATMOSPHERIC AND
GROUND EFFECTS
PROPAGATION
TIME LOOP
NOISE PLOTS
OASPL, PNL, EPNL
AT OBSERVER LOCATIONS

Figure 3.- CTOL noise prediction.

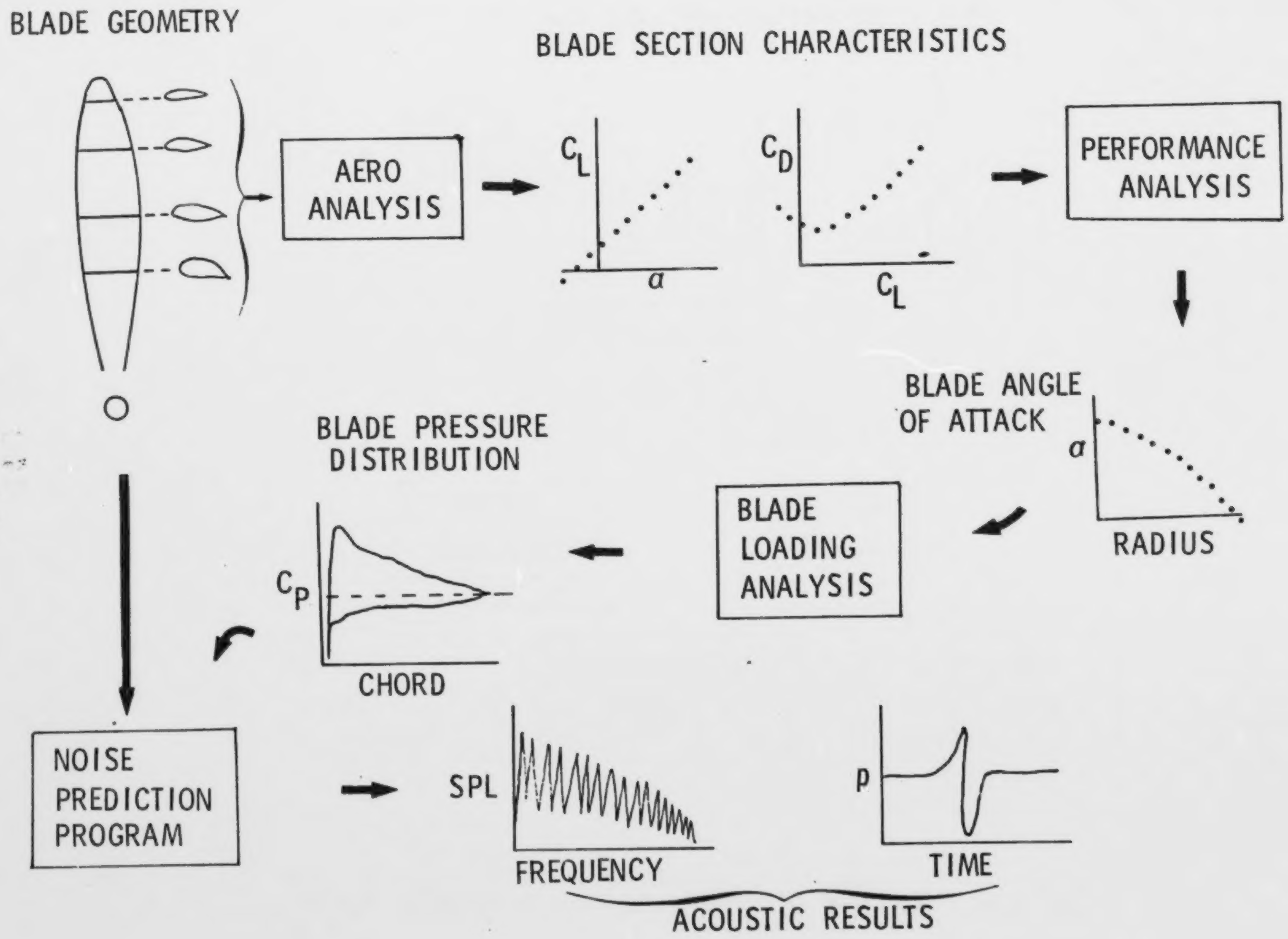
BLADE GEOMETRY
BLADE SECTION CHARACTERISTICS
AERO ANALYSIS
C_L
α
C_D
C_L
PERFORMANCE ANALYSIS
BLADE ANGLE OF ATTACK
α
RADIUS
BLADE LOADING ANALYSIS
BLADE PRESSURE DISTRIBUTION
C_P
CHORD
NOISE PREDICTION PROGRAM
SPL
FREQUENCY
p
TIME
ACOUSTIC RESULTS

Figure 4.- General aviation propeller acoustic design process.

ANOPP PROPELLER / ROTOR ACOUSTIC ANALYSIS MODULES

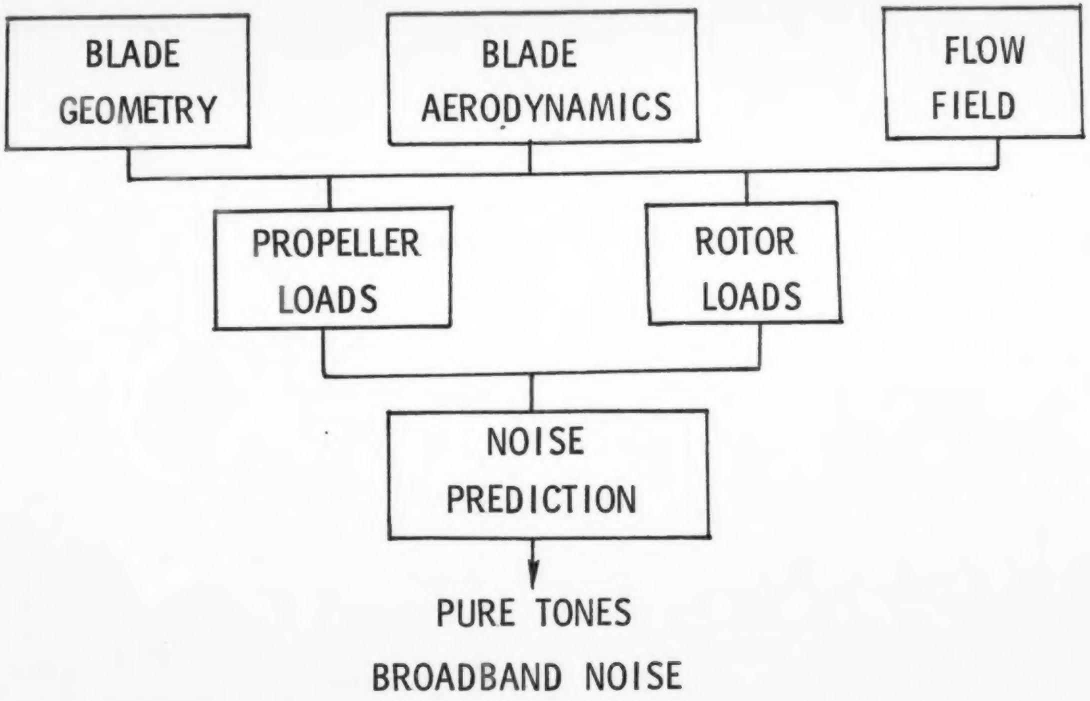
BLADE GEOMETRY
BLADE AERODYNAMICS
FLOW FIELD
PROPELLER LOADS
ROTOR LOADS
NOISE PREDICTION
PURE TONES
BROADBAND NOISE

Figure 5.- ANOPP propeller/rotor acoustic analysis modules.

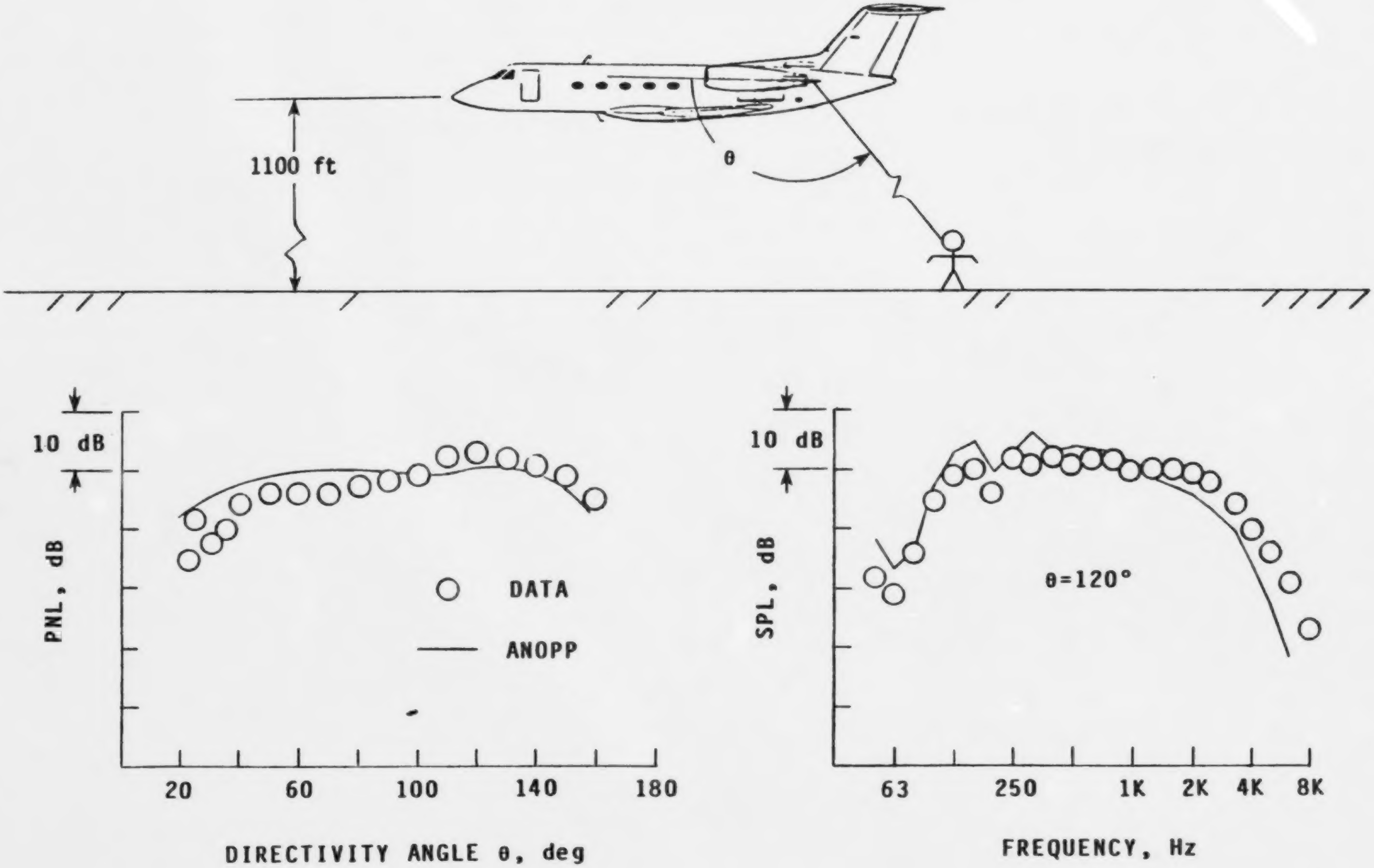

Figure 6.- ANOPP noise prediction for Gulfstream II.

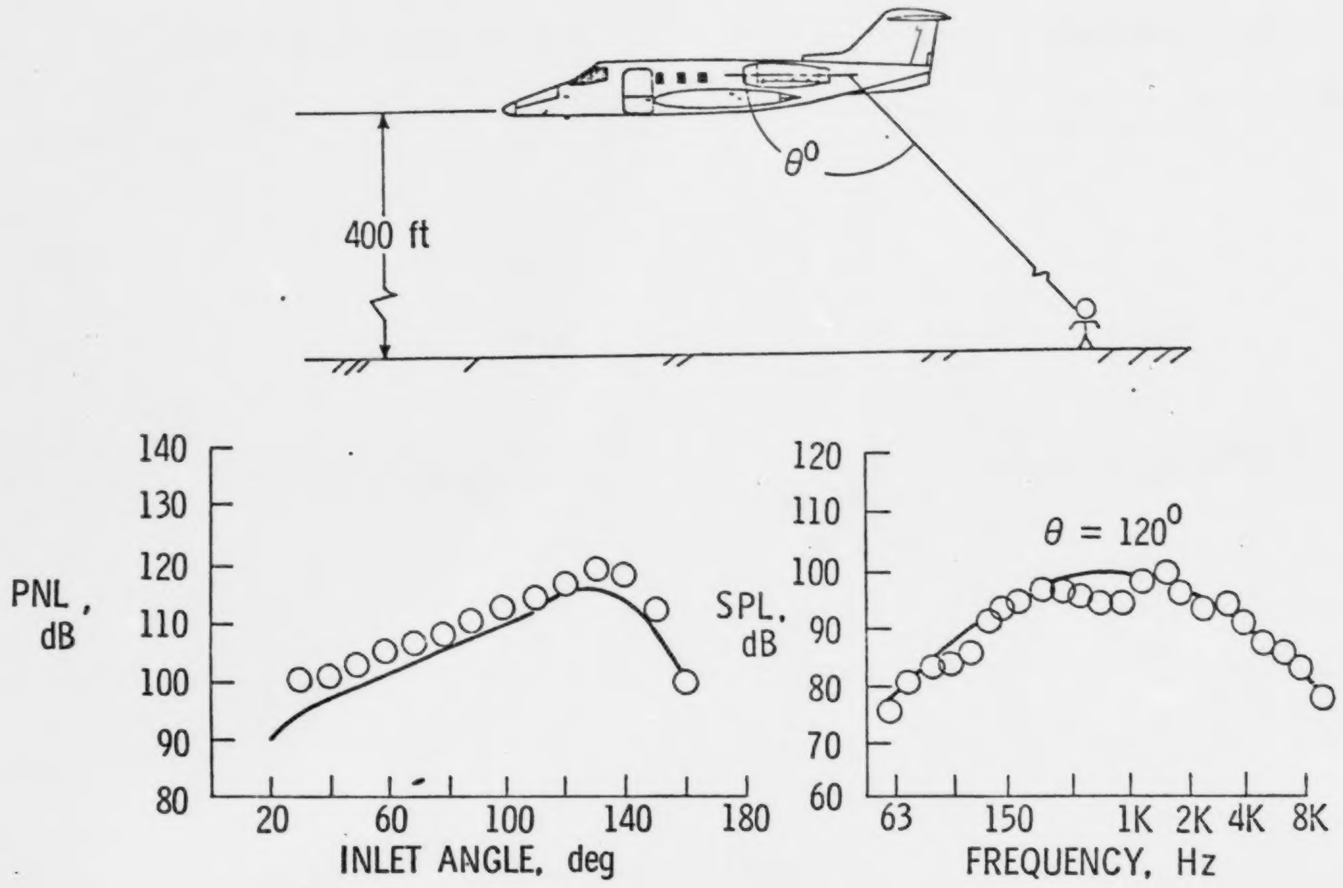

Figure 7.- ANOPP noise prediction for Lear Jet.

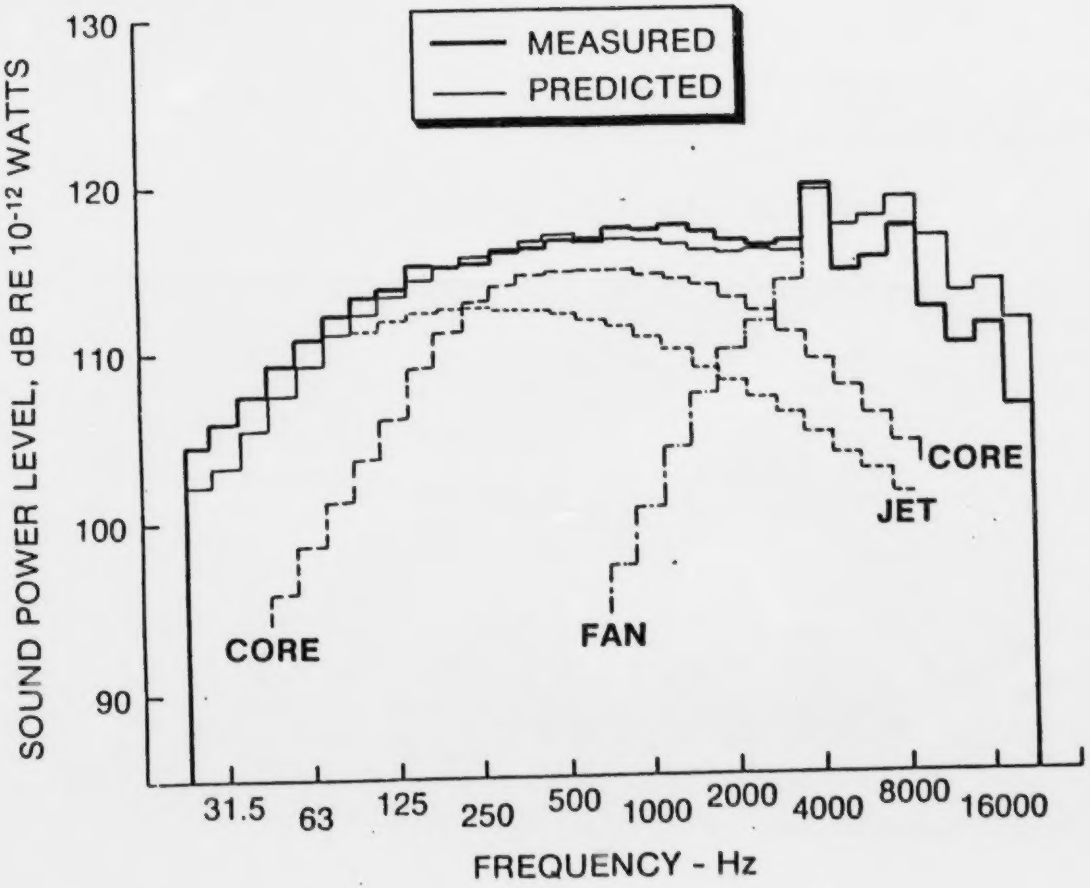

Figure 8.- Predicted and measured QCGAT static noise levels.

QCGAT ACOUSTIC PERFORMANCE

CONDITION	EPNL GOAL EPNdB	DELIVERED ENGINE EPNL, EPNdB
Takeoff Flyover	69.4	68.4
Takeoff Sideline	78.4	70.6
Approach Flyover	83.4	77.3

Figure 9.- Comparison of QCGAT noise goals with calculated noise levels at FAR-36 measurement points.

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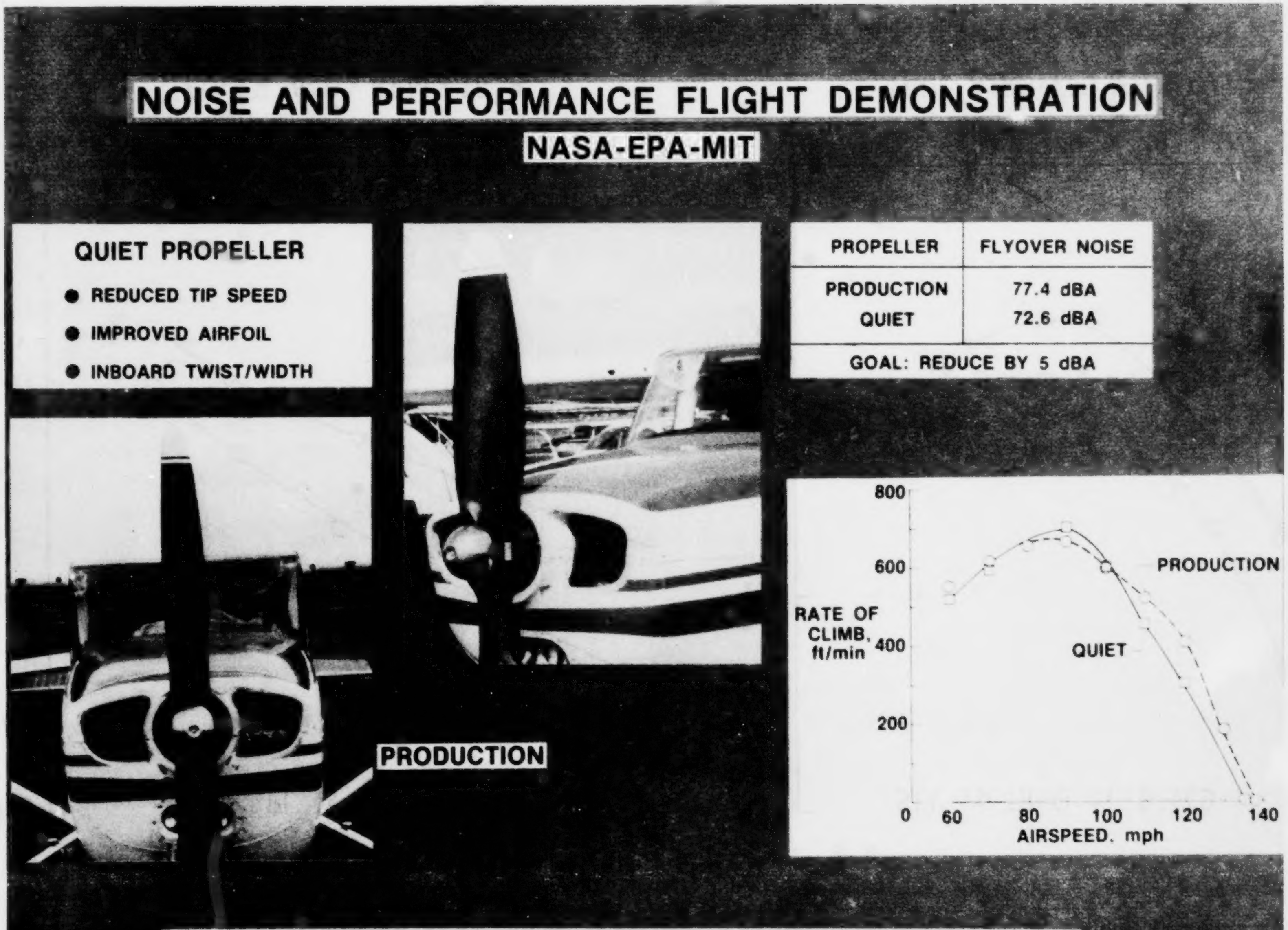


NOISE AND PERFORMANCE FLIGHT DEMONSTRATION

NASA-EPA-MIT

QUIET PROPELLER

- REDUCED TIP SPEED
- IMPROVED AIRFOIL
- INBOARD TWIST/WIDTH

PROPELLER	FLYOVER NOISE
PRODUCTION	77.4 dBA
QUIET	72.6 dBA
GOAL: REDUCE BY 5 dBA	

PRODUCTION
RATE OF CLIMB, ft/min
800
600
400
200
0
60
80
100
120
140
AIRSPEED, mph
PRODUCTION
QUIET

Figure 10.- Noise and performance flight demonstration.

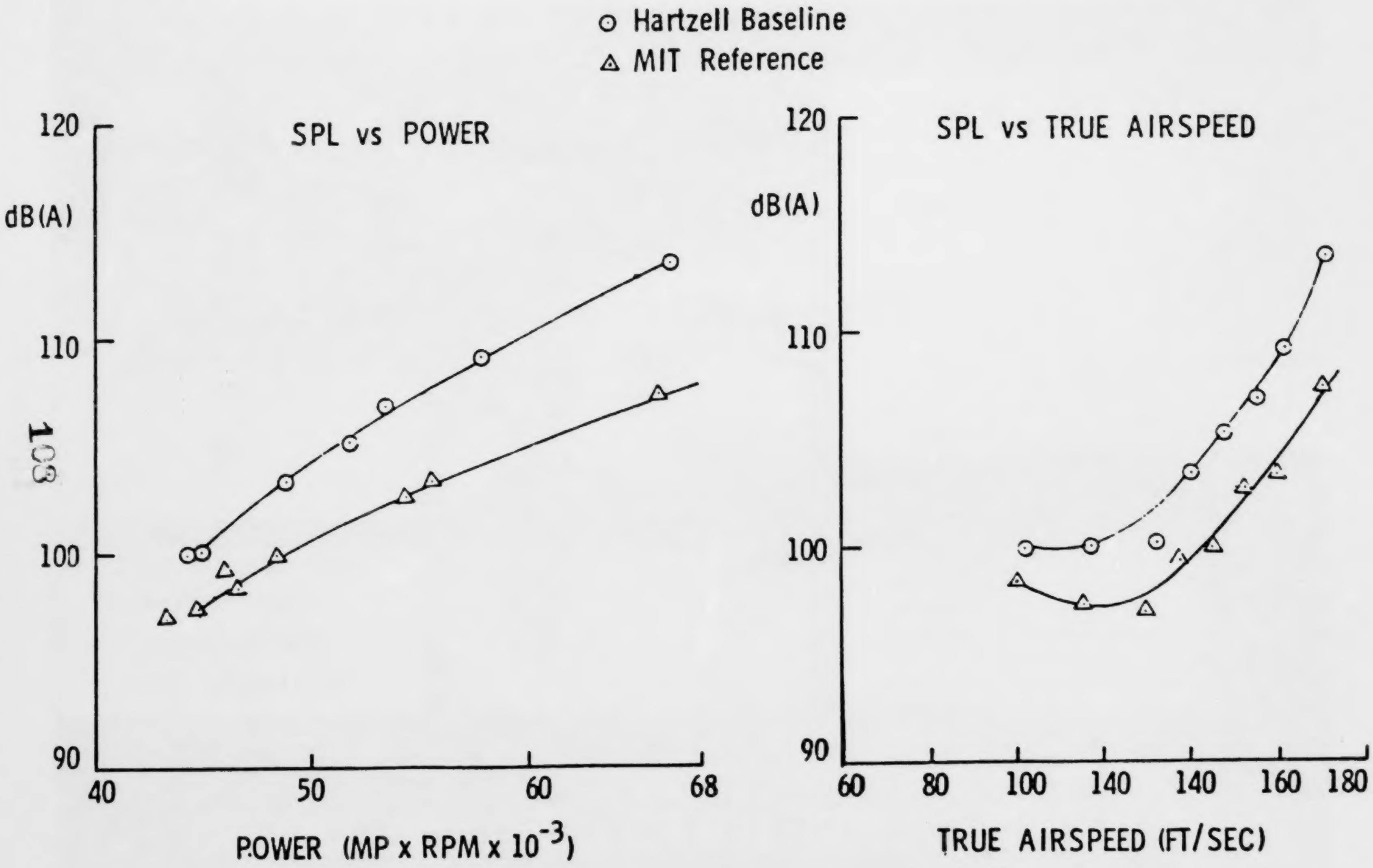


Figure 11.- MIT (Cessna 172) noise/performance results.

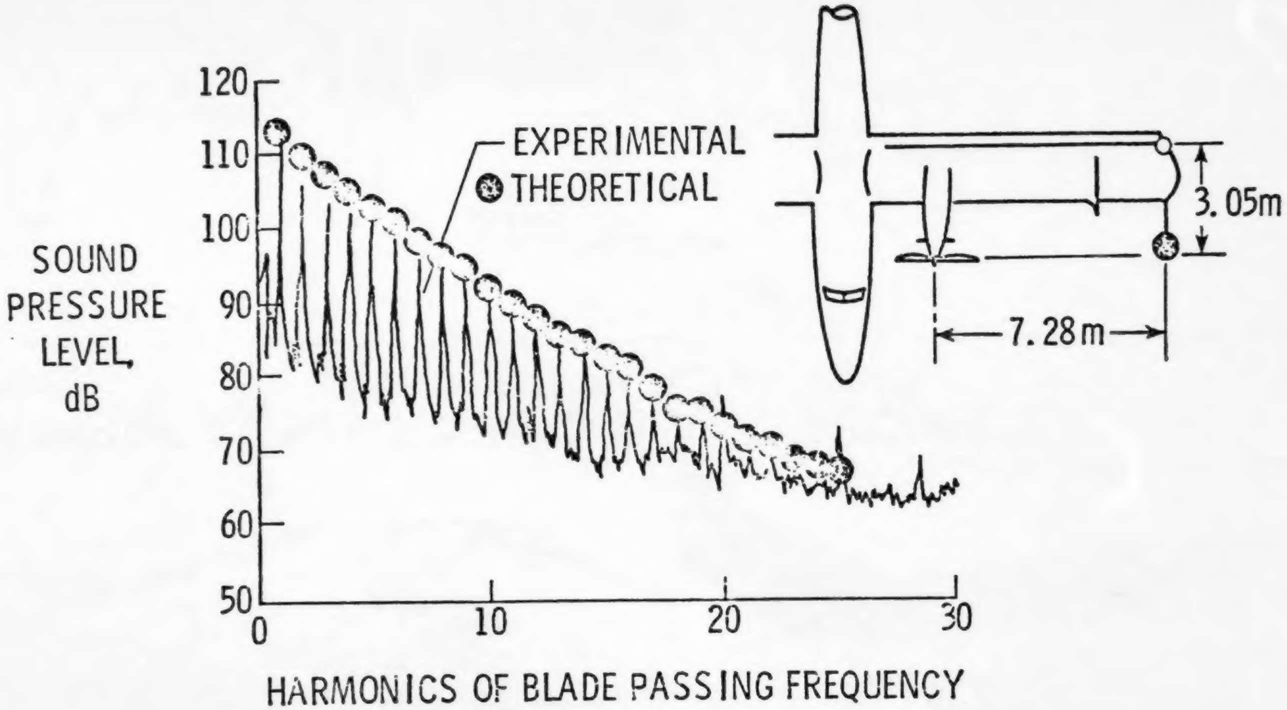
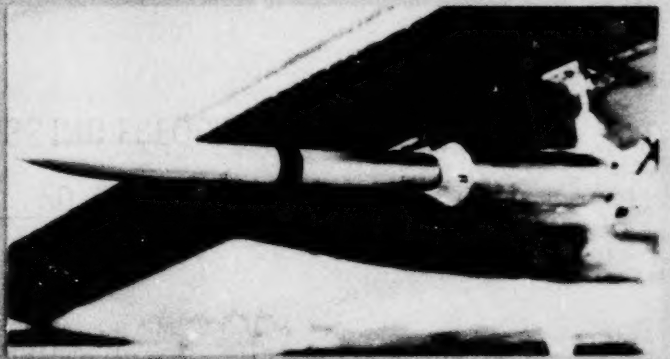


Figure 12.- Comparison of measured and calculated noise levels for a propeller in flight.

COMPARISON OF CALCULATED AND MEASURED NEAR-FIELD NOISE

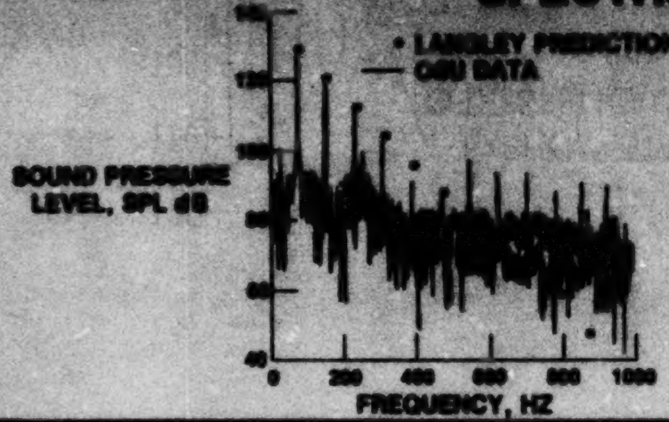
JETPROP COMMANDER 1000



ACOUSTIC PROBE

VEL.=180 MPH, ALT.=10000 FT.

SPECTRUM



OASPL, dB

MEASURED	PREDICTED
130.9	129.2

Figure 13.- Comparison of calculated and measured near-field noise.

GENERAL AVIATION AIRPORT NOISE
OPERATIONAL NOISE ABATEMENT PROCEDURES
TURBOJET AND PROPELLER DRIVEN AIRCRAFT

CHARLES N. COPPI
GENERAL AVIATION MANUFACTURERS
ASSOCIATION

GENERAL AVIATION AIRPORT NOISE
OPERATIONAL NOISE ABATEMENT PROCEDURES
TURBOJET AND PROPELLER DRIVEN AIRCRAFT

PURPOSE

To significantly improve community acoustic environments through the use of safe, airworthy and FAA certified operational procedures.

* Quiet-Flying *

GAMA'S POSTURE

- We are responsible manufacturers in the aviation industry.
- We are genuinely concerned about the noise issues.
- We do understand the problems.
- We have applied practical and proven technology for aircraft noise control thru acoustic treatment and re-engining.

- BUT -

- More can be done for general aviation airport/community noise relief and we are willing to do something about it.

OUR OBJECTIVE

- "Real-World" audible noise relief for communities.

OUR OBJECTIVE (Continued)

- Noise abatement procedures tailored to general aviation airports.
- Focused "quiet flying" techniques applicable to each airplane type originating with flight crew training.
- Realistic airport noise policies developed jointly with airport authorities, industry and the FAA.
- Enforceable procedures that are FAA approved and included in the flight manual.
- Noise abatement profiles applicable to in-service fleets as well as new type designs.

THE ROOT OF THE PROBLEM

- Is there a national priority for noise control -
  - Is it real or imaginary.
- If it is real, then things have to change -
  - Everyone has to contribute to the solution.
  - Regulations, flight operations, airport planning and air traffic control must be redefined to achieve the results.
- But it can be done safely and with sound logic
  - The methodology exists to solve the problem.

THE CURRENT SITUATION

- All aircraft comply with FAR 36. However, Part 36 does not universally guarantee meaningful community noise relief.

- Why?
    - It is a comparative acoustic index - not a problem solver.
    - It was conceived for large airports.
    - It specifies certification of the "noisiest" aircraft configuration.
    - It does not acknowledge operational abatement methods.
    - It does not address the general aviation airport problems.
        - But it was the right step at the right time to put a lid on noise. -

THE DILEMA

- Application of "safe-technology" has been pretty well exercised despite advances made in engine and propeller acoustics.
- Some aircraft have no "quiet-engine" alternatives.
- We cannot adopt a cavalier attitude toward the reliability, performance and cost factors solely for the satisfaction of noise reduction.
- And what do we do with the massive number of in-service aircraft that are threatened by emerging noise policies.

-"Quiet-Flying is a Safe, Logical and Immediate Solution"-

GULFSTREAM AMERICAN ACTIVITY

- We have devised and demonstrated an effective "quiet-flying" procedure.
- We are doing missionary work - and our homework.
    - Extensive analyses - safety is the keynote.
    - Seminars for the fleet operators.
    - Flight demonstrations at noise sensitive airports.
    - Cockpit videotape for crew workload analysis.
    - Preliminary flight manual data for service trials.
    - Discussions with FAA, GAMA, NBAA, NASA.
    - Discussions with airport authorities on noise policies.
    - Implementing predictive noise programs to help operators/airports.
- And we have submitted an official proposal to FAA requesting a certification basis.

GULFSTREAM "QUIET-FLYING" PROCEDURE

- The Events:
    - Normal twin engine takeoff
    - Select gear up after liftoff
    - Select partial flaps immediately
    - Accelerate to final segment takeoff speed
    - Reduce thrust to power for level flight with one engine operative
    - Resume normal climb at 3,000 feet.

GULFSTREAM "QUIET-FLYING" PROCEDURE (Continued)

- "Quiet-Flying" configuration achieved in 12 sec. at about 400 feet.
- Excess performance margins improve along the flight path.
- Crew functions are timely and routine -- consistent procedure.
- Engine failure reaction time sufficient to comply with worst case FAA single engine takeoff profile.

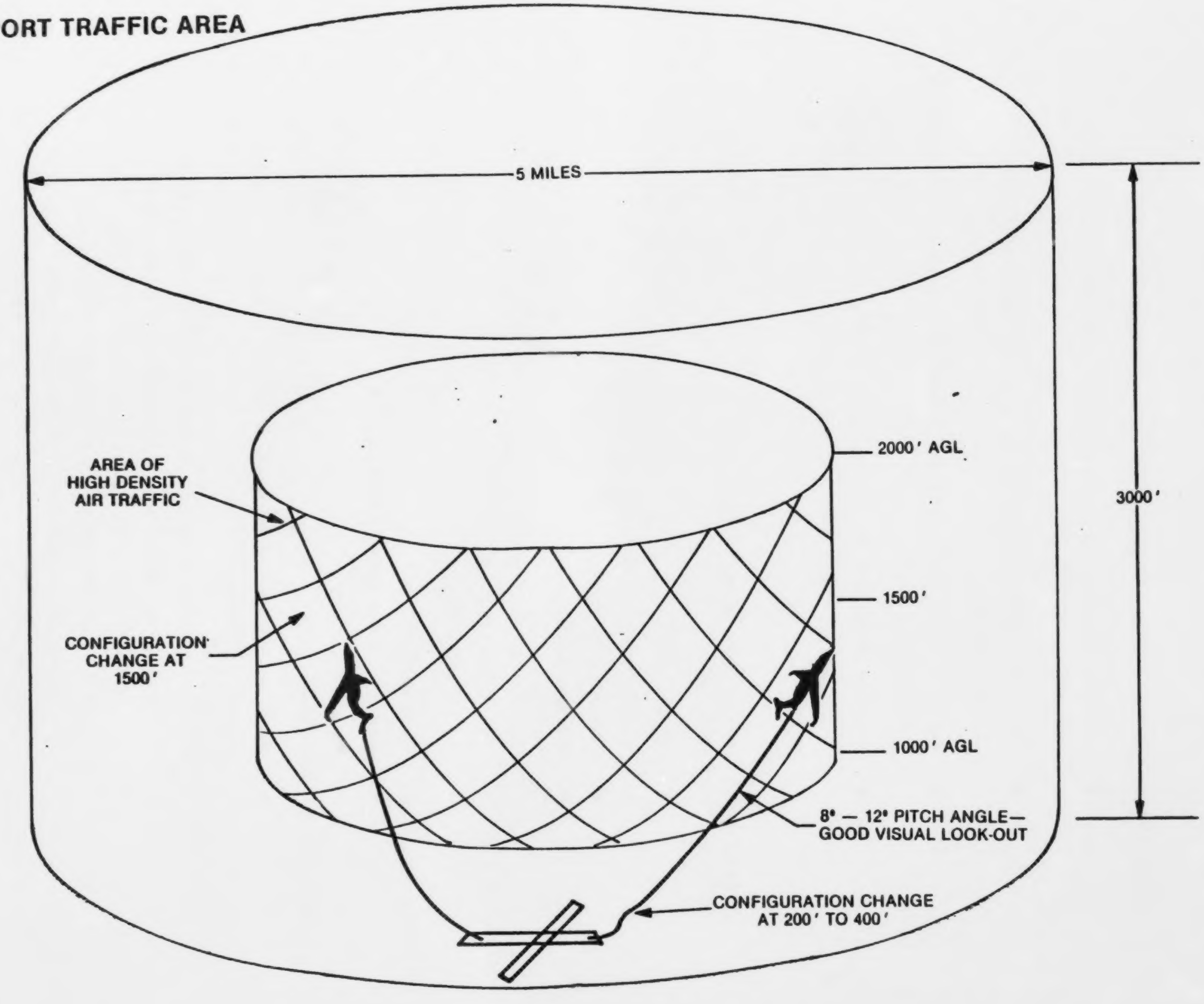
OPERATIONAL PROCEDURES MAY BE USED TO REDUCE NOISE DURING:

- Take-off
- Climb-out
- Departure route
- Pattern flying
  - Down wind leg
  - Base leg
  - Final leg
- Cross-country
- General low-level flying.

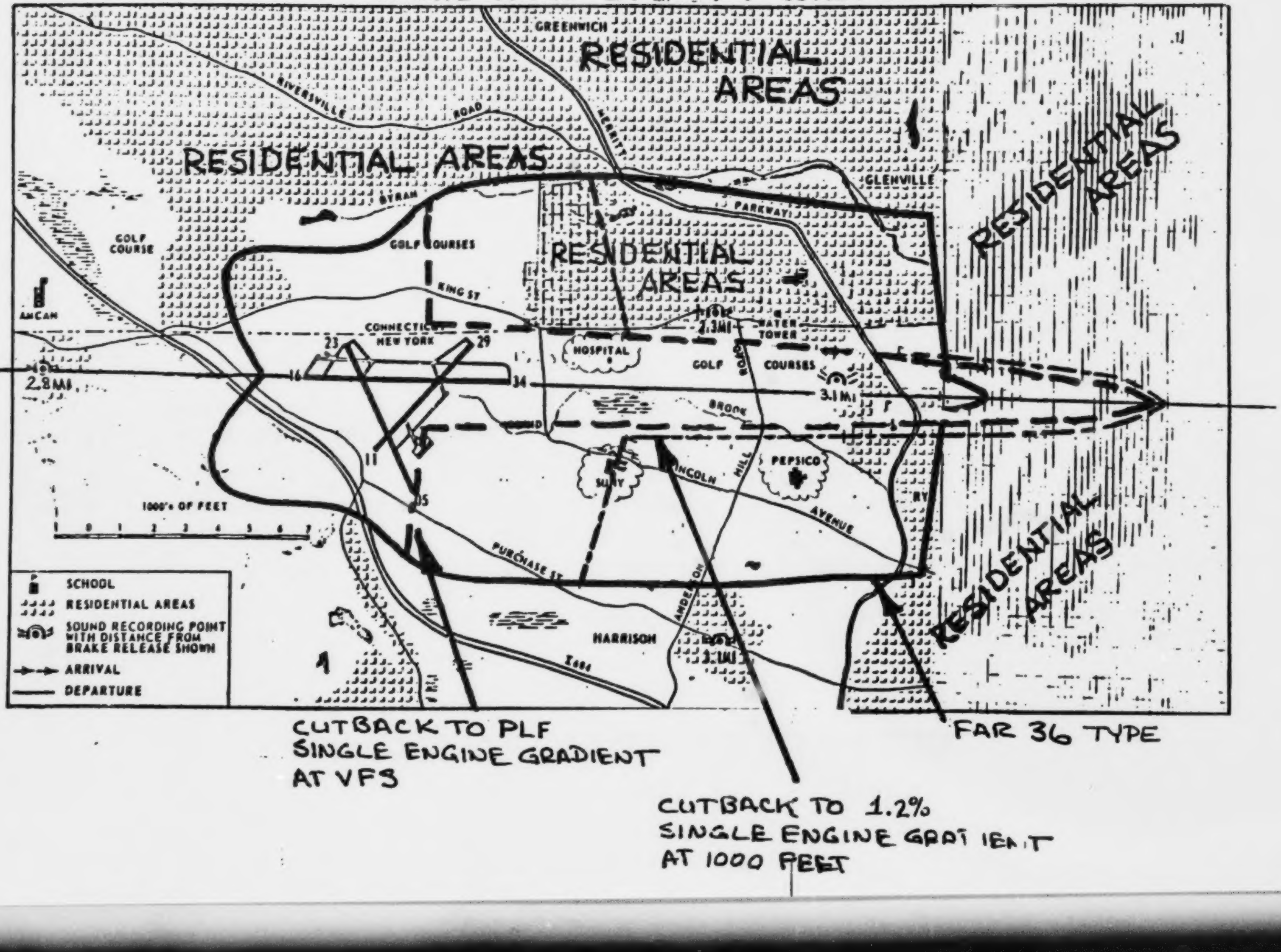
LOW RPM = LOW NOISE

- Some examples of possible noise reductions during 1,000' flyover:
  - A turboprop which develops the same maximum power at both the maximum allowable RPM and with a 200 rpm reduction showed a decrease of 10.6 dBA with the 200 rpm reduction. This shows possible effect of unnecessary use of fine pitch in the pattern or approach.

AIRPORT TRAFFIC AREA


5 MILES
3000'
2000' AGL
1500'
1000' AGL
AREA OF HIGH DENSITY AIR TRAFFIC
CONFIGURATION CHANGE AT 1500'
8° — 12° PITCH ANGLE— GOOD VISUAL LOOK-OUT
CONFIGURATION CHANGE AT 200' TO 400'

NOISE FOOTPRINTS
WESTCHESTER COUNTY AIRPORT



RESIDENTIAL AREAS
RESIDENTIAL AREAS
RESIDENTIAL AREAS
RESIDENTIAL AREAS
RESIDENTIAL AREAS
GREENWICH
RIVERSVILLE ROAD
MERRITT
PARKWAY
GLENVILLE
BYRAM
GOLF COURSES
GOLF COURSE
KING ST
AMCAN
CONNECTICUT
NEW YORK
HOSPITAL
2.3MI
WATER TOWER
GOLF
ROAD
COURSES
BROOK
3.1MI
2.8MI
16
34
23
29
11
35
SUNY
LINCOLN
HILL
PEPSICO
AVENUE
RY
PURCHASE ST
ANDERSON
HARRISON
I-684
3.1MI
1000's OF FEET
0
1
2
3
4
5
6
7
SCHOOL
RESIDENTIAL AREAS
SOUND RECORDING POINT WITH DISTANCE FROM BRAKE RELEASE SHOWN
ARRIVAL
DEPARTURE

CUTBACK TO PLF
SINGLE ENGINE GRADIENT
AT VFS

CUTBACK TO 1.2%
SINGLE ENGINE GRADIENT
AT 1000 FEET

FAR 36 TYPE

IMPACT ON GENERAL AVIATION AIRPORT COMMUNITIES

	GULFSTREAM II NON HUSH-KIT 155	GULFSTREAM II HUSH-KIT 100	GULFSTREAM III HUSH-KIT 250
Case I - Current Situation	Stage I	Stage II	Stage II
Case II - Do Nothing but Promote Stage III	Stage I	Stage II	Stage II
Case III - Approve "Quiet-Flying"	Below Stage I Almost Stage II	Below Stage II Almost Stage III	Below Stage II Almost Stage III

- Approximately 500 aircraft fleet thru 1987.
- Certifiable "Quiet-Flying" would allow immediate and significant community noise relief on a fleet-wide basis.

LOW RPM = LOW NOISE (Continued)

- A midpower range series of aircraft of the same basic design, but with different powerplant installation showed the following changes. In all cases, the rpm reduction was 175 with the greater dBA reductions being for the higher design power engines.
    - 90% power, -11.0 dBA
    - 84.6% power, -8.4 dBA
    - 88.7%, -6.8 dBA
- For the lower end of the power range:
    - 75.2% power, -175 rpm, -5.2 dBA
    - 75.2% power, -375 rpm, -7.7 dBA.

"QUIET FLYING" BENEFITS

- The public interest is definitely served.
- FAA can immediately accelerate noise alleviation programs.
- Permits reasonable and practical policies at noise sensitive airports.
- FAA can combine adequate safety and airworthiness standards with meaningful noise abatement operations for qualifying aircraft.
- Manufacturers will fulfill obligations to in-service fleets to improve airport/community relations.

RECOMMENDATIONS

- Distinguish between general aviation and transport type aircraft.

RECOMMENDATIONS (Continued)

  - Design requirements dictate different aircraft characteristics.

- Establish FAA policies to blend adequate airworthiness standards with effective noise abatement procedures.
- Establish methodology to certify operational procedures and include them in approved flight manual.
- Listen to the aircraft manufacturers - we know how our aircraft perform.

IN CONCLUSION

- General aviation industry can and has stepped up to the problems -

WE CAN HELP

- Benefits from new technology are long-term and will not address current fleet noise situations.
- Operational procedures can result in significant noise relief -

NOW

AIRPORTS -- THE BALANCE BETWEEN THEIR BENEFITS TO THE COMMUNITY AND THEIR NOISE IMPACTS

JUDITH RICHARDS HOPE
WALD, HARKRADER & ROSS

AIRPORTS -- THE BALANCE BETWEEN THEIR BENEFITS TO THE COMMUNITY AND THEIR NOISE IMPACTS

Mr. Chairman, representatives of federal, state and local governments, distinguished guests, ladies and gentlemen:

It is a great pleasure and honor to be invited to speak before one of the most knowledgeable audiences in the country on the thorny subject of airports and aviation noise.

As Steve Starley's kind introduction indicates, I am a trial lawyer. I first became involved in aviation noise policy issues as Associate Director of the White House Domestic Council during the Administration of President Gerald R. Ford. In 1979, I tried the Santa Monica Airport case involving flight and noise restrictions. I am currently involved in airport disputes at Santa Monica, Love Field, and Westchester County Airports.

As a Washington lawyer, I am part of the three greatest lies you hear from the Nation's Capital --

-- your federal check is in the mail --

-- we gave at the state level --

-- and, of course, I'm from Washington -- and I'm her to help.

Washington is an amazing city, made up mostly of lawyers and consultants. You understand, I know, about lawyers: when there's only one lawyer in town, there's not nearly enough legal work to keep him busy. But as soon as a second lawyer moves in, both have more than they can handle!

Consultants, on the other hand, are quite a different breed: they're the folks walking down Pennsylvania Avenue wearing the long gold watch chains with a Phi Beta Kappa key at one end -- and nothing on the other!

Lawyers and consultants, of course, have had a lot to do with how our aviation noise policies have developed over the years. Come to think of it -- that may be the trouble! Some say that the aviation noise problems of today all began with the development of the jet engine. I disagree. Although technology has caused some of the problems, and has provided substantial solutions as well, both the problem and the solutions to it are much more complex. The growth of our aviation industry has tracked the growth of our commerce and population centers. Airports which were originally located far from city centers have attracted commercial as well as residential development. Land developers, wanting to use every inch of space, have been permitted by local government entities to develop housing, schools, and hospitals near expanding and busy airports. This combination of aviation growth and urban growth set the stage for the intense, local airport-related disputes with which all of you are familiar. And when airport proprietors, neighbors, and local governments were unable to resolve their increasing conflicts, they turned for help to that far-from-perfect forum -- the courts.

The seminal legal case which addressed some of these problems -- and which has laid the foundation for the conflicts between airports, neighbors and users to this day -- is Griggs v. Allegheny County, decided by the Supreme Court of the United States in 1962. In that case, Griggs, an airport neighbor, sued Allegheny County, the proprietor of the Pittsburgh Airport, for "taking" his property without paying him for it. The case illustrates the lethal combination of poor airport planning, thoughtless flight patterns authorized by the Civil Aeronautics Administration, and an extreme intrusion into the life of a family living at the end of a runway. The facts were that regular and almost continuous daily flights, often several minutes apart, were made by the number of airlines directly over Griggs' residence, some clearing his chimney by only 11 feet. The Griggs family was unable to sleep even with earplugs and sleeping pills; the windows of their home rattled and plaster fell down from the walls; their health was affected; they were afraid -- and with good cause for, as a member of the Airline Pilots Association admitted, "If we had engine failure we would have no course but to plow into your house." And ultimately

Griggs was forced to move. He sued, claiming that Allegheny County's establishment of the Greater Pittsburgh Airport together with the Federally-established flight paths "took" his property and that he was entitled to be paid for it. The Supreme Court agreed, ruling that because Allegheny County did not acquire enough land for its airport, it must pay damages for the land which it was in fact using but for which it had not paid. Griggs pitted airport proprietors, concerned about enormous liability for airport noise, and airport users, seeking to serve the interests of aviation and community commerce, at each other throats. In my view, however, the dissent of Justices Black and Frankfurter in the Griggs case would have gone a long way to alleviating these problems, then, and for the future. Black and Frankfurter reasoned as follows: Since the greater Pittsburgh Airport was financed in large part by funds supplied by the United States to induce localities like Allegheny County to set up national and international air transportation systems, the federal government, not each locality, should pay the liability bill for establishing that system. They said:

> "The planes that take off and land at the Greater Pittsburgh Airport wind their rapid way through space, not for the peculiar benefit of the citizens of Allegheny County but as part of a great, reliable transportation system of immense advantage to the whole Nation in time of peace and war. Just as it would be unfair to require [Griggs] and others who suffer serious and peculiar injuries by reason of these transportation flights to bear an unfair proportion of the burdens of air commerce, so it would unfair to make Allegheny County bear expenses wholly out of proportion to the advantages it can receive from the national transportation system."

Nevertheless, Griggs' imposition of liability on the local airport proprietor remains the law of the land to this day. And, as they say, the rest is history. Local proprietors' liability for constitutional "taking" has recently been extended by the Supreme Court of California to impose liability for nuisance damages as well. (Greater Westchester Homeowners Association v. City of Los Angeles, 160 Cal. Rptr. 733, 603 P.2d 1329 (Cal. Sup. Ct. 1979).)

Without replacing the Griggs liability concept, however, the Supreme Court in 1973 held that the federal government had plenary power over aviation noise issues, at least insofar as restrictions on aviation activities were imposed by *non-proprietors* of airports. This ruling, of course, is found in the landmark aviation noise case of *City of Burbank v. Lockheed Air Terminal, Inc.*, decided by the Supreme Court in 1973. (411 U.S. 624) That case involved a Burbank municipal ordinance which prohibited jet aircraft departures between 11:00 p.m. and 7:00 a.m. from the privately owned and operated Lockheed Air Terminal. Proof at trial showed that at least one flight per night -- and only one flight -- would be affected by the curfew. The Supreme Court reviewed the extensive federal statutes regulating aviation, including those specifically concerned with noise control. They concluded, by a 5-4 vote, that the federal regulatory scheme even then was so comprehensive and pervasive that it pre-empted any state or local regulation in this field. The Court ruled, for example, that the Noise Control Act of 1972 "reaffirms and reinforces the conclusion that FAA, now in conjunction with EPA, has *full control* over aircraft noise, pre-empting state and local control." (411 U.S. at 633.)

But, in the now-infamous footnote 14 in *Burbank*, the Supreme Court noted a statement by the then Secretary of Transportation that federal law may not affect the authority of airport proprietors to "deny the use of their airports to aircraft on the basis of noise considerations so long as such exclusion is non-discriminatory." Rather than endorsing this statement, the court concluded that it did *not* have to consider "what limits, if any, applied to a municipality *as a proprietor*."

Virtually all of the airport noise litigation since *Burbank* in 1973 has, of course, involved restrictions by prioprietors of airports -- not non-proprietors. In fact, shortly after the Supreme Court decision, the City of Burbank purchased the Lockheed Air Terminal, and Burbank is now engaged in attempts to impose the very restrictions on Burbank Airport as a proprietor which were unconstitutional before the Airport was owned by the City of Burbank.

Thus, once again, O'Houlihan's first law of Airports strikes: Everything that can possibly be done by lawyers, judges, planners, and users to confuse the issue will and has been done.

Legal disputes after *Burbank* have relied much more on the footnote than on the text of the opinion. In fact, the rule now seems to be that the footnote has swallowed the main case. Courts throughout the United States, from New York -- the *Concorde* cases -- to Kentucky -- the disputes over the *City of Audubon Park's* regulations -- to California -- the *Hayward*, *Crotti*, *Gianturco* and *Santa Monica* cases -- all hold that non-proprietors cannot enact curfews, cannot enact single event restrictions and cannot otherwise affect the levels of operations at airports in their areas, But proprietors, solely by virtue of the fact that they are liable in damages, can impose and enforce curfews, single-event noise limits, and other restrictions.

This rule leads to virtually impossible situations, both for the airports and for the users. The local community and the local airport want the highest level of service and revenues possible to support the local economy so long as the service provided is quiet, unobtrusive, limited to a few hours of the day, and does not subject the airport proprietor to lawsuits for "taking" and nuisance. According to the 1976 Aviation Noise Policy issued by the federal government, there is Federal jurisdiction not only over the navigable airspace, but also over review of all operational noise control procedures and restrictions on operations, including limits on the number of operations per day or per year, curfews, and prohibitions on operations by particular types or classes of aircraft. But, the federal government asserts their right to review these limits only as long as they do not cross the line and admit federal preemption, in which case, of course, the federal government rather than the proprietors would become liable in damages to airport neighbors.

I submit to you that the entity which wants to call the tune, and actually does call the tune, should be the same entity that pays the Piper. I believe it is time to admit that the Emperor really doesn't have any clothes on, that the web and sheer magnitude of federal regulation of aircraft noise, and of aircraft operation from the start of taxi roll to arriving at the hangar after touchdown, are within the control of the federal government. If the federal government and the courts would admit this, it would be easier for all of us: for the federal system, for planners, for users of airports who try to fly the patchwork quilt of local regulations in this country today, and even for local communities trying to regulate their airport while facing suits from neighbors on the one hand and from people like me on the other.

But, as all of you know, we are not there yet. The Emperor's clothes still exist, transparent as they are, and therefore we must try to work it out as best we can. And so, at last, I come to my assignment today: the benefits, burdens, and expectations of local airports.

I think all of you know of the benefits. Particularly in an era of aviation deregulation, with increasingly less air carrier service to the smaller communities, general aviation airports provide the link from those communities to passenger and freight service throughout the nation. General aviation airports are not only for pleasure flying and the hot-rodders. They serve an important business purpose in local, state and national economies. They provide passenger service through commuters and air taxis, as well as private aircraft. They provide emergency medical services to people who might otherwise die before reaching a hospital. They help develop natural resources in remote areas of our country. They provide a network of support and training for our national defense as well as our commercial aviation system. The Air National Guard, the Coast Guard, and the traffic helicopters all use general aviation airports. If it sounds like I'm pro-aviation, you bet I am! But I live in the flight path of Washington National Airport as well and have a first-person understanding of the problems confronted by airport neighbors. As always, a balance must be struck between the benefits and the burdens of an airport. The balance can be struck by good planning, by cooperation, by a willingness of each side to listen and work with the other. What, then, do aviation users expect?

Well, of course they expect basic facilities for: Fixedbase operators who provide service, training, sales, and tie-down space. They expect good airport planning and this should include planning for runup areas where the noise will be least disturbing, with provision for test cells, fenced areas and even jet-glass. (ADAP Legislation, when it passes, will again provide money for these purposes.) Good airport planning also means parallel runways to separate high performance aircraft from low performance aircraft. The separation, of course, permits the high performance aircraft to land more quickly, without as much use of flaps to slow their speed, which increases drag, power, and decibels.

Airport users need and expect good community planning, as well. Zoning restrictions should be built into any airport plan. They should be enforced even as land values go up, and real estate developers lobby city and county agencies to permit the building of residential communities virtually off the end of the runway.

But airport users also expect support from the local community in return for the value which they are adding to the community. Community vendettas against airports serve only to harden the position of each side, producing a lot of smoke, a lot of lawsuits (which is certainly good for my business, but not for aviation) and very little resolution of the problems.

Finally, all those involved in airport planning and use need to engage in a continuing dialogue in order to preserve existing airports, reduce exposure to liability suits stemming from noise complaints, and enhance the quality of life in airport environments.

And, there is something that can be done -- now.

General aviation manufacturers are about at the limit of noise technology. Even the technological improvements which can still be made will not substantially reduce the fleet noise level over the next decade because of the large numbers of older planes in the general aviation fleet and the very modest noise reductions which new technology will permit. But major reductions in the average daily noise level of airports across this nation can be made with safe and approved noise reduction operational procedures. The National Business Aircraft Association has pioneered noise abatement procedures for operations of their fleet aircraft. They are engaged in a continuing public relations effort with their pilots. Communities should also take up this public relations effort and encourage pilots to fly quietly. Moreover, what is really needed is the adoption nationwide of low noise operational procedures. The methodology is available. It can and would affect virtually all aircraft, making significant contributions to the average or cumulative noise levels in the areas surrounding airports. And it can be done within two years. FAA could, for example, certify noise abatement techniques for insertion in all airplane flight manuals or pilot's operating handbooks used in general aviation aircraft. These procedures could be tested, and optimized, consistent with safety, to produce the lowest level of noise practicable. For simple, and quiet, training aircraft, procedures could be equally simple -- perhaps no more than a caution to observe recommended flight paths or minimum altitudes and reduced power settings while in the airport pattern. For the more complex, professionally flown corporate aircraft, detailed control and power schedules may well be appropriate.

FAA is today in the position to test such a concept for use at Washington National Airport, an airport it owns. And if the concept proves out, it could be adopted for all airports in the National Airport System Plan and for those not in the plan that have received federal funds. The General Aviation Manufacturers estimate that such techniques could reduce the average 24-hour noise level at most general aviation airports by five to six decibels within two years. This contrasts with a less than one decibel reduction in more than a decade if we rely on improved aviation technology alone.

In conclusion, we can't eliminate noise, because to do so would eliminate the vital services which aviation provides to all our communities. But working together -- planners, state and local governments, users, and the federal government -- we can lower the level, not only of noise, but also of confrontations over the Nation's airports. In fact, if you all do your job right, and if the Federal Government will admit that aviation noise is a national concern which must be funded and solved first at the Federal level, you might just put me out of the business of litigating aviation noise cases.

Thank you very much.

F

AIRPORTS - HOW CAN THEY MINIMIZE THEIR NOISE IMPACT ON THE COMMUNITY?

DENNIS DAYE
WILBUR SMITH & ASSOCIATES

AIRPORTS - HOW CAN THEY MINIMIZE THEIR NOISE IMPACT ON THE COMMUNITY?

Historical Prospective

In 1903, after driving 45 days and waiting 19 more for the delivery of fuel and supplies, the winner of the first transcontinental automobile tour arrived in San Francisco, having traveled from New York via Cleveland, Chicago, Omaha, Wyoming, Idaho and Oregon. In December of the same year, the Wright Flyer made its first successful flight at Kitty Hawk, North Carolina, ushering in the first shock wave of the airplane boom. Railroad expansion was coming to an end and the automobile and airplane in a few years would make their impact on our daily lives.

Keep in mind how we have depended on the automobile during the past several decades and at the same time think about the decline in other types of transportation: canals such as the Chesapeake and Ohio, which George Washington and some of his colleagues thought would bring prosperity to Georgetown; and the Erie Canal (known as Clinton's big ditch) which led to the creation of the Baltimore and Ohio Railroad. We are not constructing many new canals and railroad development is rather limited even though research is continuing in an effort to develop high speed rail facilities between major cities.

The airplane is here and air travel is on the increase. Is it possible, as if by the working of natural laws, we can anticipate the coming decline of the automobile? Is it not time for us to give more attention to airports than parking garages and streets?

Please do not misunderstand, I am simply trying to emphasize the point that we live in a world of change and we must take deliberate actions to plan for change. It is so easy to postpone planning for our future when we have immediate problems.

Permit me, if you will, to indulge in a little more history. As you may guess, I am a history buff.

While the Wright Brothers and others were making improvements to their planes in the early 1900's, city planners were beginning to focus on problems created by growth in our major cities of the day.

The upsurge in population touched off orgies in land development and people were platting and selling lots inside as well as beyond corporate limits. In many instances these lots were next to railroads. Think about your own community for a miniute. In all probability, your city has "shotgun" homes on lots 25 feet wide either on or near railroads - unless they have been removed in recent years through urban renewal or increased private sector activity. We should be thankful we had only a few airports in those days, otherwise we would be buying narrow lots at premium prices to expand runways.

In 1909, just five years prior to the first scheduled airline service in the United States, the First National Conference on City Planning and the Problems of Congestion convened in Washington. While I cannot find any reference in the proceedings to airports, it is interesting to note that those persons present discussed migration from rural areas to the cities, congestion in housing, congestion in streets, inadequate parks and playgrounds, overhead wires, ugly advertising signs, improper location of public facilities and so on. I doubt anyone here today attended that conference; however, I imagine you have attended a conference in the last several years and heard the same subjects discussed.

City planners began to worry about airports and their locations just after World War I and especially during the roaring 20's. It was suggested by some early city planners that airports should be located away from the city but linked to the city by a special purpose road. The idea was to keep the airports away from congested areas. Why would the planners make this proposal? Well remember that we were in the roaring 20's and the architects of the day were designing skyscrapers with visions of great structures thrusting heavenward with little thought of the congestion they created. Traffic engineers came forth with proposals for two level streets and magazines published drawings of airports supported by hundred story skyscrapers or by steel towers rising from piers along major waterfronts. By having the landing fields on top of buildings, it would not be necessary to acquire more land for airport expansion since all you had to do was wait for another skyscraper and then extend the runways.

Without trying to discuss air transportation since the 1920's it is suffice to say that air travel has grown extensively, planes have increased in size and efficiency and we still find ourselves playing "catch up ball" as we plan our airports to meet future air travel and air cargo transportation needs. We continue to have problems associated with development near our airports and the complaints of airport neighbors about expansion and of course the noise of aircraft - the topic of today's session.

Comprehensive Community Planning

Airport planning must be recognized and considered as an integral part of the community's comprehensive planning program. As we know, comprehensive planning is concerned with orderly and systematic development of the entire community. It is definitely concerned with existing problems, but it has a special focus upon problems that will be created by future growth; problems that can be avoided or more easily solved by thinking about and preparing for the future.

Airports, without a doubt, are a significant economic asset to our communities and also without a doubt they can and do create problems relating to land development and noise. Therefore, the location, size and layout of the airport should be coordinated with major land uses in the area. Unfortunately, however, as airport planners, we do not often have the opportunity to plan and build airports in areas where we can avoid problems with noncompatible land uses and noise. If we could find a place, the developers would follow and develop nearby properties and then complain about the noise generated by the airport. Yes, the airport operator has the good life.

NOISE IMPACT ON THE COMMUNITY

Considerable attention has been given to land use planning adjacent to airports in an effort to develop properties for uses which will not suffer because of aircraft noise. Planning Commissions and local governmental units have adapted building codes, land use plans and zoning ordinances to specify the types of development which can be located near airports. However, as we all know, pressures by local citizens and persons in the development business can get ordinances changed.

Since the airport operator, in many cases is not a governmental unit with a legislative body, it does not have the power to adopt zoning ordinances and land use plans to protect the airport. What then can the airport operator do to minimize the airport noise impacts on the community?

The objective then is to develop and implement a Noise Abatement Program which will involve the generators and recipients of noise in a combined effort to alleviate noise problems at general aviation airports.

The Airport Noise Control and Land Use Compatibility (ANCLUC) study is an effective means by which to detail the methods to alleviate noise conflicts and the few studies which have been completed have done this admirably. It appears, however, that some studies stop short of outlining the methods to reduce noise and do not develop effective recommendations for the implementation of a noise abatement program.

In order to develop and implement a noise abatement program, the airport operator should make every effort to bring about cooperation between the aviation community, private interests, the business community, local governments and nearby airport neighbors. Each community should be investigated to determine its airport needs, including the need for the airport and the level and quality of service so that noise abatement programs can be tailored and balanced to specific community desires and needs.

The Noise Abatement Program

The Noise Abatement Program is the direct result of recognizing that there are or will be conflicts between the operation of an airport and the land uses near it. But why do these conflicts occur? It is not solely because aircraft make noise. Does a tree which falls in the middle of the woods make noise if there is no one to hear it? It takes two to tango - a noise generator and a noise recipient.

In the past, urban sprawl has led to encroachment of incompatible land uses even in areas where land use controls were available to public officials to prevent it. The implementation of a Noise Abatement Program must consider this and be balanced in order to be effective. It must present actions to reduce, remove, or prevent source noise as well as reduce, remove or prevent the perceptors of aircraft noise.

Since active participation by local governmental agencies as well as the airport operator is imperative to a successful Noise Abatement Program it must have some teeth in it. The teeth that we would like to discuss includes commitments and incentives built in to the program to encourage all those with responsibility for noise generation and noise recipients to aggressively attack those portions of the program over which they have full or partial control.

For those who are responsible for noise generators, they can abide by the approach and departure procedures, curfews, etc. to reduce noise impact. Others responsible for land use controls should develop, monitor and enforce these controls.

Some of the problems that may occur when attempting to implement a Noise Abatement Program result from poor or total lack of organization and cooperation of those who are interested or have the power to aid in the alleviation of noise problems. The lack of communication is also a problem which must be overcome in order to mount an effective public relations campaign to reduce noise impacts.

Committees on Noise

How many times have you groaned when someone said a committee was going to be formed to study a given problem or prepare a program to achieve a specific goal by a given date. We have committees focusing on neighborhood planning, economic development, school playgrounds, downtown revitalization and so forth. Well, it is time to groan again because we are going to suggest that the airport operator create two committees on noise to help develop and implement a Noise Abatement Program. Please remember that the airport operator, with some exceptions of course, does not have legislative authority; therefore, it is not possible to legislate a noise abatement program. The airport operator must then work through means of friendly persuation, commitments and incentives to achieve goals.

Since a Noise Abatement Program normally involves actions with regard to air traffic and aviation facilities (Airside) as well as actions relating to land use activities (Landside), it is recommended that two committees be formed to represent the interest of the airside and landside aspects of the Program. These committees - Aviation Committee on noise and Community Committee on noise - can develop a noise abatement program if good people are appointed to serve and work for the common good of the community and the aviation industry.

Committee Roles

The Committees will function as a review and advisory body to the Airport Commission and/or the Airport operator depending upon the degree of authority vested in the Airport Commission by the Airport Owner.

They should be comprised of those individuals with interest in the Noise Program and/or those who have the authority to at least initiate actions to implement the program. In effect then, the Committee members, collectively or individually represent "Action Teams" through which the program can be effectively implemented. For example, members on the Landside Committee, should include those elected or appointed officials whose agencies are responsible for enactment and eforcement of land use controls. When new controls are recommended, they will be responsible for the initiation of the governmental processes to institute these controls and report to the Committee the progress of the action at the schedule meetings.

Commitment to the Resolution of Noise Problems

It doesn't make any difference if you have these committees and a good Noise Abatement Program unless there is a commitment to actively attack the tasks required to implement the program and resolve noise conflicts. So, for the Program to function effectively, it is strongly recommended that Official Resolutions and/or Letters of Agreement be considered and signed between the various groups and organizations responsible and/or affected by noise or the Noise Abatement Program. Some examples are:

1. Aviation Committee on Noise - Resolutions of support and cooperation by the elected officials of the local governing and planning bodies (City, County, Region, State), the Airport Commission, flying clubs, pilots and owners' associations, business and homeowners associations, civic groups, and air traffic control personnel.

2. Community Committee on Noise - Letters of Agreement and Support between:

   a. Local governing bodies and the Airport Commission;
   b. Flying Clubs and the Airport Commission;
   c. Pilots and Owner's association and the Airport Commission;
   d. Air Traffic Controllers and the Airport Commission;
   e. Homeowners associations, civic groups and business associations with the local governing bodies; and,
   f. Vice versa.

These resolutions and letters of agreement are felt to be essential in the effective implementation of a Noise Abatement Program, particularly in the cases involving agreements regarding cooperation between the Airport Commission and the local governing bodies since it is from these two areas where the majority of the responsibilities lie. One must support the other in order to mount an effective implementation program. They represent written commitments to actively support the Noise Abatement Program.

Funding The Noise Abatement Program

Implementation of many aspects of a Noise Abatement Program requires that the Airport Operator and/or Owner supply the appropriate percentage of funds needed to be eligible for Federal grants under the Airport and Airways Development Aid Program. This bill is not currently (late 1981) in effect but is being discussed in Congress. Many actions, which will not be itemized herein, of a Noise Abatement Program are eligible for Federal funding, but in order to receive those funds a certain percentage (dependent on new legislation as well as airport classification) must be supplied solely from state or local sources or a combination of both.

Sources of Revenue

State funds can be applied to the funding of a Noise Abatement Program. The amount available varies from state to state and cannot be relied on to supply all the funds necessary to qualify for Federal participation. Therefore, it is reasonable for the airport management, local government agencies, and other groups, organizations or individuals with interest in the airport and/or the Noise Abatement Program to anticipate, or at least consider, contributing financially to the costs of implementing the Program. Possible sources of these funds are:

1. Airport Administration
    a. Landing Fees
    b. Fuel flowage fees
    c. Rental or lease fees
    d. Fee assessment on noisy aircraft
2. Local Governmental Bodies
    a. Property tax on aircraft and/or aviation related private facilities
    b. General Fund
    c. Municipal Bonds
3. Private Sources with Vested Interest in the Airport or the Implementation of the Noise Abatement Program
    a. Businesses and business organizations which utilize the airport and recognize the importance and benefits of air transportation
    b. Real estate developers with vested interest in properties in the near-airport environment

The decision as to which of these sources and others may be tapped to provide funding is complex and should be based on the previously mentioned balancing of the airport's and airport user's needs (and the community benefits accruable to the airport) with the community's need for the airport as well as its need for relief from aircraft noise.

Balancing the Needs and Funding

The sources of funding of a Noise Abatement Program should be directly related to needs - need for aviation facilities and air transportation, and the need for relief from noise impacts. Aircraft operators need aviation facilities, local businesses and citizens need air transportation, and airport neighbors need relief from noise impact. These needs should identify funding sources and the level of funding required from those sources.

Take a case where a small community has a small industrial base which depends heavily on air transportation in its daily business. The community's economic well being is dependent on the economic well being of area businesses which rely on air transportation and could feasibly contribute a large share of the required funding in order to keep the airport open and available to area businesses possibly avoiding the potential of a plant closing. In many cases, use of air transportation by business has provided increased business and the need to expand and hire more employees, further benefitting the community.

On the opposite end of the scale is the large community with an airport that may or may not be used extensively by business but results in excessive noise impact on the community. In this case it appears that a major portion of the local cost of the Program should be borne by the airport and the airport users. However, care must be taken in either case so as not to overburden the community or the airport and its users.

If the community is asked to contribute a large portion of the necessary funds, the attitude may develop that the airport is too expensive to operate at its present level of activity and restrictions or even airport closure may result. On the other hand, if airport users are heavily taxed, they may feel that the airport is too expensive to use and remove their operations and air transportation service. Again, we emphasize, the critical need for balancing.

It is these two basic factors which must be weighed when attempting to balance the funding of Noise Abatement Program. These factors should be investigated with recommendations regarding proportionate sharing of the local costs in an Airport Noise Control and Land Use Compatibility Study (ANCLUC). Annual cost estimates for implementing the plan and prioritization of Program items will aid in identifying the annual levels of funding required from participants. The balancing of the Noise Abatement recommendations with the community should also be accomplished in conjunction with the ANCLUC Study.

Incentives

It sounds good to say that needs and funding levels should be balanced so that the Noise Abatement Program can be effectively implemented, but what happens if all this occurs and the noise impacts still exist. We have recommended a Noise Abatement Program, we have established bodies to implement the Program, we have discussed funding of the Program, and established committees from affected parties. So what else is left to do. Provide Incentives for active pursuit of implementing the Plan.

Recommending that actions be taken is far more easily accomplished than the actions themselves and incentives (teeth) are needed in many cases to implement the Noise Abatement Program.

Incentives may come from several different sources and specific incentives should be designed to result in specific actions. Of course, one of the major and most common inducements is public pressure which directly or indirectly contributes to the implementation of all aspects of a Noise Abatement Program and will not be discussed in the following sections. To say that public pressure is a prime motivating factor is, for the purposes of this presentation, adequate. However, one of the most powerful incentives involves the pocket nerve - money.

Incentives for Aviation Interests

There are means by which penalties for non-compliance with established noise abatement procedures may be assessed. Establishment of these penalties should be directed towards specific infractions. Activities which may be accomplished by aviation interest may include:

1. Preferential Runway Use;
2. Noise Abatement Operational Procedures;
3. Construction of Facilities to move aircraft noise away from noise-sensitive areas;
4. Implementation of full or partial curfews to eliminate all or "noisy" aircraft operations, emergencies excepted, during specific hours, normally at night;
5. Transition by aircraft owners to quieter aircraft.

Items 1 and 2 fall under the category of operational/procedural actions and the rest may be considered regulated or limiting actions.

Possible Incentives for Assuring Operational/Procedural Compliance?

1. Establish approach for the preferential runway which is operationally more, advantageous than approaches to the remaining runway(s) at the airport;

2. Establish criteria with regard to weather conditions for the use of the preferential runway such that penalties may be assessed for non-compliance except in cases of emergency or safety considerations;
3. If an air traffic control tower is operational at the airport or this service is provided for the airport from other airports, establish within the limitations of the air traffic controllers authority and according to the specific situation, pilot advisories regarding preferential runway use. This information may also be provided via aircraft-to-ground communications of the airport operator or Fixed Base Operator;
4. Install additional navigational aids to establish Noise Abatement procedures turns and approach/departure procedures.

Inducements for Adherence to Curfew Restrictions

The incentives to establish curfews are inherent in public pressure and should be addressed in the ANCLUC study.

Since aircraft operators may at times consider the possibility of disregarding the imposed curfew restrictions and in fact violate them, they should be prepared to provide restitution in order to avoid total disregard of the curfew by numerous airport users. At airports where the policy of a "Voluntary Curfew" is in effect, restitution is not applicable unless it is also voluntary.

Very often the most effective incentive for aircraft operators to abide by the curfew regulations is the imposition of landing fees particularly established for this type of violation. This may present problems regarding enforcement at low activity airports that are not operated on a 24-hour basis but then, noise problems at these airports are normally not significant enough to warrant a curfew.

At high activity airports, several levels of curfew may be adopted with specific land fees applied to those aircraft operators choosing to utilize the facility during the curfew hours. They are, beginning from strictest curfew to least strict:

1. Absolute curfew - airport closure
2. Banning all "Noisy" aircraft operations - all hours
3. Banning all aircraft operations - specific hours
4. Banning all "noisy" aircraft operations - specific hours
5. Partial ban on "noisy" aircraft operations - all hours
6. Partial ban on "noisy" aircraft operations - specific hours

By the imposition of landing fees assessed on aircraft operators operating during the curfew hours, the incentive for them to adhere to the curfew regulations is based on financial considerations which is, in many cases, the strongest incentive. The assessment should be determined based on published noise data for specific aircraft. These publications are FAA Advisory Circulars 36-1B, 36-2A, and 36-3A. Fees should be non-discriminatorily assessed soley on the relative "noisiness" of the aircraft and/or area of the noise "footprint" associated with that particular aircraft. In other words, aircraft emitting equivalent noise levels and impacting equivalent areas are assessed the same landing fee in similar situations.

Inducements For Aircraft Owners to Transition to Quieter Aircraft

There currently exists two possible ways for aircraft owners to obtain quieter aircraft; engine retrofit of the currently owned aircraft or purchase of different aircraft, both of which represent significant investments.

However, based on the owner's need for personal air transportation and rationale for utilizing the airport (which normally lack of a convenient alternative airport with proper facilities) and the realization of the need to reduce noise generation, he may of his own volition acquire a quieter aircraft. But this is not always the case.

There are, of course, other means by which aircraft owners may be persuaded to switch to quieter aircraft. One is peer pressure. Pilots and owners of aircraft based at the airport should be encouraged to discuss with "noisy" aircraft operators the possibility of switching to a quieter aircraft. Discussions of this nature could also take place between the airport management and local governmental officials as well. This may or may not result in a commitment from the aircraft owner to quieter operations now or at a later date but there is no legal means by which such a transition is assured.

One means by which transition to quieter aircraft may be induced is to offer incentives to the operators of "quiet" aircraft. In many cases, the imposition of landing fees for "noisy" aircraft may first need to be established so that the incentive (removal of fees) procedure may be initiated. This procedure may be established so that as time passes and the aircraft owner does not acquire quieter aircraft, he begins to suffer increased costs in using the airport. This may be accomplished by establishing a base year operational level for the aircraft and reducing the number of operations annually that he is allowed before he is assessed the landing fee. If the airport currently has a landing fee, this additional fee would have to be related to noise. In other words, the aircraft owner would have to pay for the privilege of generating noise in the area.

The annual levels could be reduced so that after a certain number of years, the owner would pay the fee for every landing.

The imposition of this type of incentive would necessarily be nondiscriminatory and applied to all aircraft determined to be noisy.

Inducements for the Encouragement of Governmental Bodies to Implement The Noise Abatement Program

The major responsibilities of landside interests in implementing the Noise Abatement Program rest with the governmental bodies having the authority to implement and enforce land use controls. A more general responsibility of these interests lie in the area of providing for the quality of life and health of the constituents. Actions which could be the responsibility of these interests (primarily local governmental bodies) include:

1. Adoption and enforcement of land use controls;
2. Provision of manpower and funding of a noise monitoring program, all or in part;
3. Provision of funds, all or in part, for the soundproofing of structures;
4. Airport owners are normally a governmental body which very often provide funding for general airport improvements as well as improvements to reduce noise impacts;

Since the major costs for the implementation of a Noise Abatement Program that originate from landside sources is expended on facilities, airport, soundproofing, noise monitoring, etc. then it is logical to assume that by the adoption and enforcement of a reasonable land use control program, many of the costs may be reduced significantly in the future. Remedial actions cost much more than preventive measures. The objective of a land use control plan is to alleviate or eliminate existing land use/noise conflicts and prevent future conflicts. It may be stated that the alleviation or elimination of noise conflicts is the "pound of cure" while the prevention of future conflicts is the "ounce of prevention." Therefore, communities may expect that short term costs will exceed long term costs and that the sooner an effective land use control program is implemented, the lower the long term costs of the Noise Abatement Program will be.

This possibility should provide the incentive for the local governmental bodies to enact land use controls as well as provide funding for mitigating existing land use/noise conflicts.

Inducements to Businesses and Business Association to Support the Noise Abatement Program

The degree of support from the business sector of the community would vary between airport locations depending upon the importance of efficient air transportation in their economic well-being. In fact, this should also concern the area residents who do not own or have interest in a business since their economic well-being is also dependent on the economic well-being of the businesses.

Businesses who utilize air transportation regularly should have vital interest in keeping the airport operational with the minimum of operational restraints as possible as well as keeping any scheduled air service that may be currently provided.

Given this, the loss of an aviation facility and air service could increase the operating cost of the business sector and it would seem reasonable to assume that business would consider contributing funds to the Noise Abatement Program. Some may be contributing through the payment of landing fees on noisy aircraft and may feel that no further contributions are necessary.

Notwithstanding, it may be worthwhile to develop a program to solicit contributions from the business sector.

Establishing a Noise Abatement Trust Fund

We have been discussing the means and sources of funds for the implementation of a Noise Abatement Program but have not talked about the administration of the funds or the establishment of noise abatement priorities.

It is therefore recommended that a fund be set up to receive these designated funds and that a Board of Trustees be appointed to administer the fund. For purposes of this discussion, the fund will be termed the "Noise Abatement Trust Fund" (NATF).

The appointment of individuals to the Board should be made so that all local agencies contributing to the fund are represented.

The Board of Trustees, based on the recommendations and priority schedules presented in the ANCLUC study, will be responsible for continuing review and setting priorities of actions of the Noise Abatement Program requiring funding. They will also be responsible for the programming of approved recommendations of the Aviation and Community Committees on Noise.

Items which may be considered for funding include:

1. Application of Trust Funds to receive Federal funding for recommended items of the Noise Abatement Program;
2. Purchase of Noise Monitoring Equipment and funding of the Monitoring Program;
3. Establishment and operating expenses of a noise complaint office;
4. Printing of noise abatement literature;
5. Funding the soundproofing of near-airport, noise-impacted structures; and,
6. Development of Land Use Controls.

Summary

The main theme throughout this seminar has been "Balancing the Needs" between the airport and the community. When considering a Noise Abatement Program, it is imperative that a close, cooperative working relationship be developed between aviation and the community. It is felt that the application of the concepts presented when reworked, reduced or expanded to meet the specific situation under consideration, will provide the basis for the effective implementation of a Noise Abatement Program while achieving a balance between airport and community needs as well as balancing funding of the program between the aviation and community sectors.

The point that active participation of all members of the Aviation Committee on Noise, the Inter-Community Committee on Noise, the Airport Commission, and local governmental bodies, is essential to the success in the effective implementation and funding of the program. The Airport Commission and airport users cannot provide for the alleviation of noise conflicts without the aid of the other agencies and the agencies cannot produce effective land use controls without the cooperation of the aviation interests and neither can do much of anything without the funding required.

Finally, providing incentives to enact the Noise Abatement Program should result in accomplishing the goal of reducing noise conflicts and provide funds for the program.

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GENERAL AVIATION AIRPORTS: GREAT EXPECTATIONS...

HAROLD LEGGETT
CRESS & ASSOCIATES

GENERAL AVIATION AIRPORTS:

Great Expectations...

INTRODUCTION

- Our Firm
- Our Clients: Communities, States, Industry
- Our Services: EA's, Noise, Master Plans, System Plans, Air Service
- Our Experience

G.A.	A.C.
Akron, OH	LEX
Big Spring, TX	BTR
Carlsbad, NM	LFT
Tulsa, OK	AMA
Pilze Co., KY	MLU
	BRO

In the consulting business, expectations are everything. Much of our work revolves around expectation, molding and reshaping them to correspond with reality. The communities we work for expect many things of their airports initially, often with little understanding of what's really possible or practical.

No matter how capable we are, how experienced, or how diligently we work, if we can't reconcil expectation and reality we can't succeed -- neither can the airport or the community.

WHAT DOES A CITIZEN EXPECT FROM HIS COMMUNITY AIRPORT?

Citizens Expect: (Somewhat Simplistically) And In The Most General Sense

- Services (including air service)
- Community Image
- Efficiency in operation and management
- Economic development incentive for business industry
- Compatibility.

The citizen, however, is unaware of the tremendous diversity among G.A. airports! This diversity has everything to do with what can realistically be expected.

G.A. Airports Are Diverse

- Ownership -- Public, Private
- Activity Levels - Second act types (5 to 400 based aircraft)
- Operation - Authority City Department, managers FBO (BRO)
- Powers - Land use policy, condemnation
- Location - Rural, Urban - residential, industrial, commercial
- Air Service - Charter to multiple commeders

- Community Relations - political relations, chambers, noise sensitivity (LFT).

This means that realistic expectations must also be diverse.

What Can Reasonably Be Expected (For A "typical" GA Airport)

- Facilities
- Services
- Fiscal Performance
- Planning
- Compatibility.

Facilities

- Navaids - locate and approach the field
- Airfield - for TO&L safety
- Terminal - for visitors/flyers
- Hangars - for adt
- Parking - for auto
- Access - for auto
- Fuel/Maintenance - for adt
- Crash/Fire/Rescue - only a large facilities.

Services (Public)

- Welcome (greeting)
- Information
- Transportation (RAC; courtesy cars)
- Lodging (nearby) data/info
- Restaurants (nearby) data/info
- Waiting Areas (well-appoint).

Services (Aviation)

- Fueling/Maintenance
- Pilot Services (weather, FST, flight
- Express Cargo

- Charter
- Flight Training
- Sales.

Fiscal Performance

- Accountability
- Capital Programming
- Grantsmanship
- Self-Sufficiency (but only in the minority of situations [5% ?].

Planning

- Based on Community Policy
- Coordinated and Cooperative
- Oriented Toward Implementation.

Compatibility (Expect)

- Noise Information Programs (to pilots, to government and realtors/lenders [also, economic impact awareness programs])
- Operational Procedures
- Physical Constraints (fuel type, R W length, lighting)
- Capital Expenditures
- Coordination and Participation

Compatibility (Don't Expect)

- Noise Exposure Guarantees
- Limits on Operations
- Aircraft-Type Limitations
- Curfews
- Enforcement

Compatibility (The Keys)

- Mutual Understanding/Education
- Commitment (by both)
- Coordination (mechanisms)
- Cooperation.

Conclusion (in summary)

- Neither can do everything!
- Everybody can do something!
- The message: work together!

LAND USE PLANNING IN THE VICINITY OF THE RALEIGH-DURHAM AIRPORT

RAYMOND J. GREEN
AICO, TRIANGLE J COUNCIL OF GOVERNMENTS

LAND USE PLANNING IN THE VICINITY OF THE RALEIGH-DURHAM AIRPORT

On July 7, 1981, the Federal Aviation Administration granted its formal approval for the construction of a 9,000-foot runway at Raleigh-Durham Airport (RDU). This culminated a 15-year effort by the RDU Airport Authority to devise an acceptable plan for runway expansion. Identified as Plan 523L, it is one of five alternative plans which were analyzed as to their effect on the environment. A schematic drawing of Plan 523L is shown on Figure I. The plan calls for the construction of a 9,000-foot runway and a 3,800-foot runway parallel to the existing main runway. The 9,000-foot runway would be designed for ultimate extension to 10,000 feet. The 3,800-foot runway would be 5,000 feet long ultimately.

The planning staffs of public agencies in the vicinity of the airport feel that a plan for the use of land is needed, for two reasons: 1) to protect the airport from incompatible land uses; and 2) to minimize the effect of aircraft noises on the surrounding area. A planning committee was established to gather and analyze the physical resources and develop a plan.[1] Coordination and support for the committee was provided by the Triangle J Council of Governments.

This paper describes the results of the committee's work.

The Raleigh-Durham Airport (RDU)[2]

The Raleigh-Durham Airport is located about midway between Raleigh and Durham, North Carolina (see the Vicinity Map). The Airport encompasses just over 4,000 acres of land, and includes two major runways. Runway 5/23 lies northeast/southwest, and is 7,500 feet long. Perpendicular runway 14/32 lies northwest/southeast, and is 4,500 feet long. Associated taxiways and terminal facilities form other major operational elements.

Although RDU serves 19 counties in central and north central North Carolina, 95% of all passenger trips were from Durham, Orange and Wake Counties in 1974.

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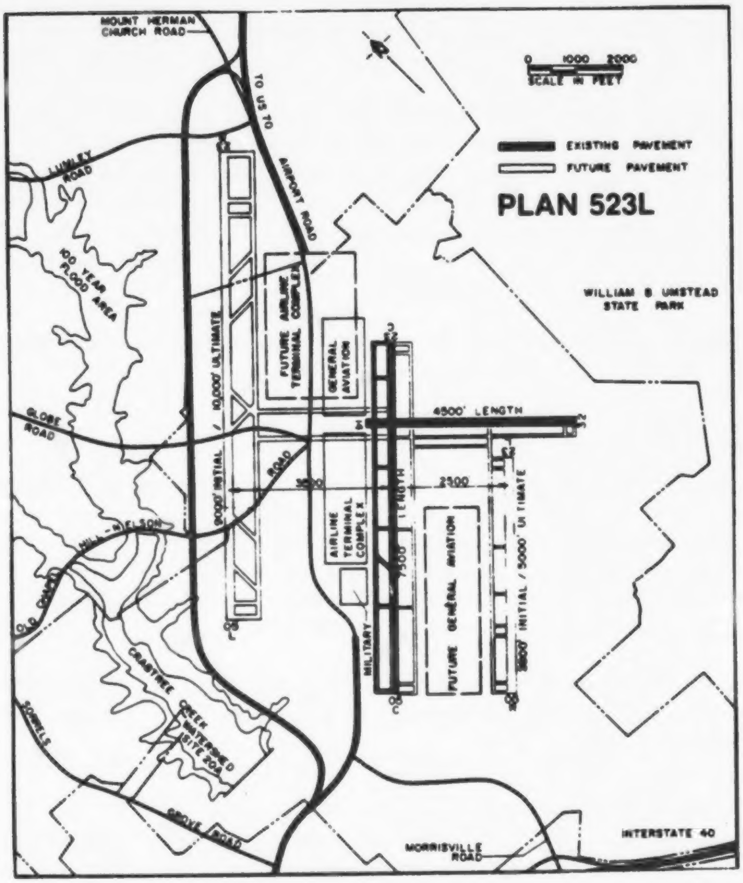
[1] The following agencies were represented on the planning committee: Wake County, Durham County, Chatham County, Durham (City), Raleigh, Cary, Morrisville, the RDU Airport Authority, the N.C. Department of Natural Resources and Community Development and the Triangle J Council of Governments.

[2] Data about RDU were obtained from Raleigh-Durham Airport Long-Range Development Master Plan and Environmental Assessment, Technical Report, Appendices to Vol. 1. Raleigh-Durham Airport Authority (March, 1980) - updated to November, 1981 by RDU staff.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SCALE IN FEET
EXISTING PAVEMENT
FUTURE PAVEMENT
PLAN 523L
LUMLEY ROAD
AIRPORT ROAD
100 YEAR FLOOD AREA
FUTURE AIRLINE TERMINAL COMPLEX
WILLIAM B UMSTEAD STATE PARK
10,000' ULTIMATE
GENERAL AVIATION
4500' LENGTH
GLOBE ROAD
9000' INITIAL
ROAD
3000
2500
7500' LENGTH
AIRLINE TERMINAL COMPLEX
HILL-NELSON
FUTURE GENERAL AVIATION
3800' INITIAL / 5000' ULTIMATE
MILITARY
OLD CHAPEL
CRABTREE CREEK WATERSHED SITE 20A
SORRELS
GROVE ROAD
MORRISVILLE ROAD
INTERSTATE 40

FIG. 1. PLAN 523L

SOURCE: Raleigh-Durham Airport Long-Range Development Master Plan and Environmental Assessment, Summary Report, Figure 25. (RDU Airport. Authority, March, 1980).

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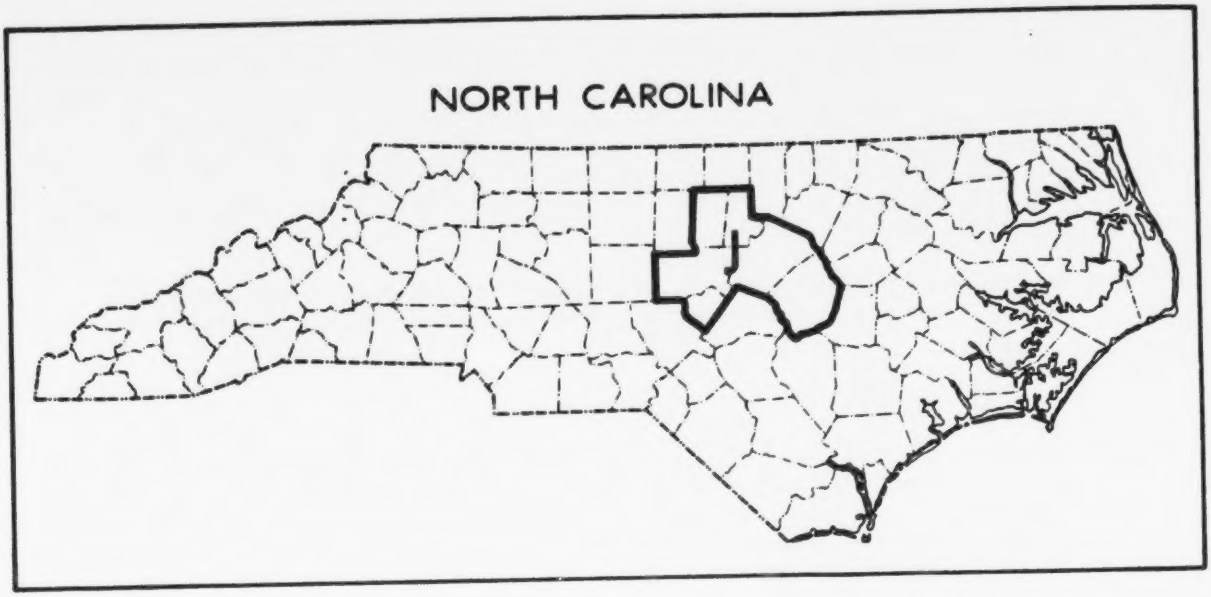
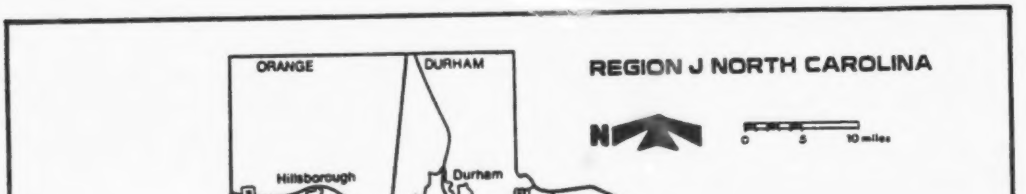


NORTH CAROLINA



REGION J NORTH CAROLINA
N
0 5 10 miles
ORANGE
DURHAM
Hillsborough
Durham
WAKE
Chapel Hill
Carrboro
Wake Forest
Raleigh
Rolesville
RDU
Zebulon
Knightdale
Wendell
Morrisville
Cary
CHATHAM
Siler City
Pittsboro
Apex
Garner
Holly Springs
Clayton
Fuquay-Varina
Goldston
LEE
Sanford
Broadway
Kenley
Selma
Micro
Smithfield
Pine Level
Four Oaks
Princeton
Benson
JOHNSTON

VICINITY MAP

RDU offers scheduled airline passenger and freight service, and includes military (Air National Guard) and general aviation activities. In 1980, there were 204,000 aircraft operations (takeoffs and landings). Of these, 65% were by general aviation aircraft, 3% were military aircraft and 32% were by air carriers. Certified and commuter carriers enplaned 886,000 passengers in 1980[3]. In terms of number of enplaned passengers, RDU ranks 69th in the nation.

By the year 2000, the number of enplaned passengers is projected to reach 2,100,000. The number of aircraft operations is projected at 301,000.

Regional Setting

Raleigh, the capitol city of North Carolina, had a population of 150,000 in 1980. The population of the City of Durham was 101,000. The third largest city in Region J (the six-county planning region shown on the Vicinity Map) is Chapel Hill, with a population of 32,000. The population of Region J was 671,000.

Other physical features which affect planning of the airport vicinity are the two reservoirs being constructed by the U.S. Army Corps of Engineers and several major highway proposals (see Map I, Regional Setting).

Airport Study Area

The boundaries of the area selected for this study are shown on Map 2, Noise Contours. For most of its length, the boundary follows physical features such as creeks or roads. In several instances, however, it is a cross-country line or a jurisdictional boundary such as the Durham - Wake County boundary.

The study area was delineated to include all the land expected to be affected by the 55 Ldn noise level. This is the level at which aircraft noise becomes distinguishable from background noise.

Map 2 also shows the 65 Ldn noise level, which is considered to be severe noise which would interfere with normal residential activities.

Major Thoroughfares

Primary access to RDU is provided by Interstate Highway 40 and U.S. Highway 70, as shown on Map 3. These two highways link Durham and Raleigh.

An outer loop is proposed to encircle Raleigh. This facility is in the preliminary conceptual stage. If completed, it would pass very close to RDU and improve access from north Raleigh - the primary growth direction in the Raleigh area.

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[3] In November, 1981, certified carriers included Altair, Delta, Eastern, Piedmont, United and US Air. Commuter carriers included Airlift, Mid-South, Wheeler and Sunbird.

An outer loop is also proposed around Cary. Again, it is in the conceptual stage.

Proposed Sewers

The development of the area between Durham and Raleigh has been retarded by the lack of sewers. Soils in the area are very poorly suited for septic tank filter fields. To remedy this problem, a number of sewer proposals have been put forth, as shown on Map 4, Proposed Sewers.

Soil Suitability

Soils in the western reaches of the study area are stiff plastic clay. They have slow permeability, high shrink-swell potential (shrink when dry and swell when wet), high erosion and low strength. They are poorly suited for most urban uses - especially for septic tank filter fields (because of the slow permeability). General soil suitability is shown on Map 5, Soil Suitability for Urban Uses.

Existing Zoning

Most of the study area is zoned for residential use, as shown on Map 6, Existing Zoning. However, a sizeable area has been designated Airport District by the Wake County Board of Commissioners. Some of the Airport District was established several years ago, when the RDU Airport Authority proposed to build two new runways perpendicular to the existing main runway. This plan was later abandoned.

Concept Plan

The plan for the future development of the RDU Airport and Vicinity - as recommended by the planning committee - is shown on Map 7. Some of the districts indicated on the plan need no further explanation. However, the following discussion is offered to clarify the intent of some of the districts:

Noise Impact Area: This is the area that would be affected by the 65 Ldn or greater noise level. It is recommended that no residential development be allowed in this area. To minimize confusion, the boundaries of the Noise Impact Area were drawn to the nearest physical feature which lies outside the 65 Ldn noise level wherever feasible. In several instances, however, it was necessary to incorporate a cross-country or jurisdictional boundary.

Floodplain: These are lands which will be permanently or temporarily under water. Structures which would reduce the flood storage capacity of the floodplain should be excluded from this area.

Research Farming Area: Basically, this area would allow for the expansion of the Research Triangle Park. In addition, farming and low-density residential development would occur in this area.

Drainage Divide: This line of dots marks off the watersheds of the Jordan Reservoir (to the west) and the Falls of the Neuse Reservoir (to the northeast). Development in these watersheds should be low-density, to protect the water in the reservoirs from pollution due to stormwater runoff.

Highway Protection Area: This would be an "overlay" district. Land use along the highways would be in accordance with the district the highway passes through - but special conditions would apply in order to minimize traffic hazards. The special conditions would include minimum spacing between entrances, increased setbacks and sign limitations.

APPENDICES

Map 1: Raleigh-Durham Airport, Regional Setting

Map 2: Noise Contours

Map 3: Major Thoroughfares

Map 4: Proposed Sewers

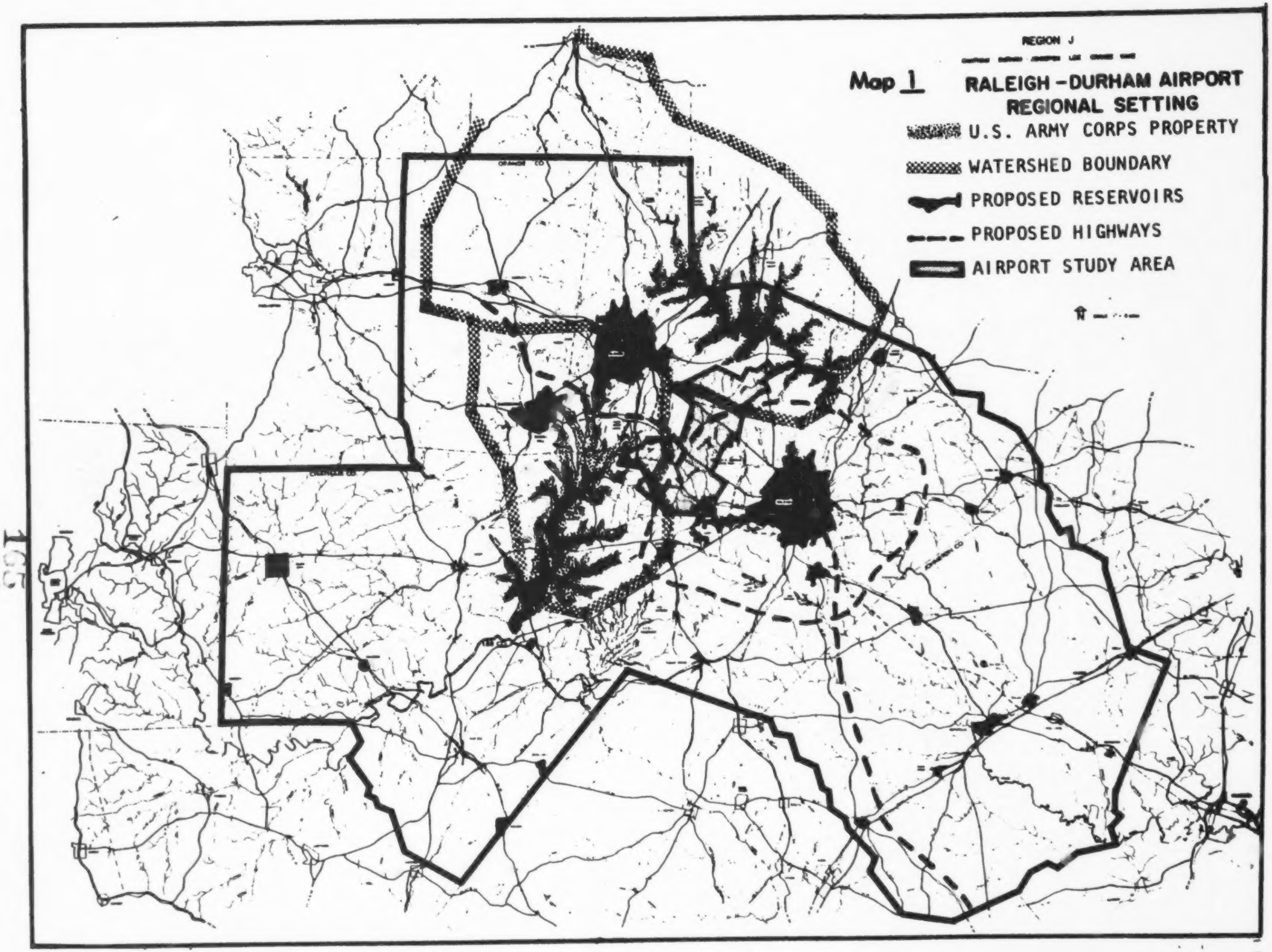
Map 5: Soil Suitability for Urban Uses

Map 6: Existing Zoning

Map 7: Concept Plan

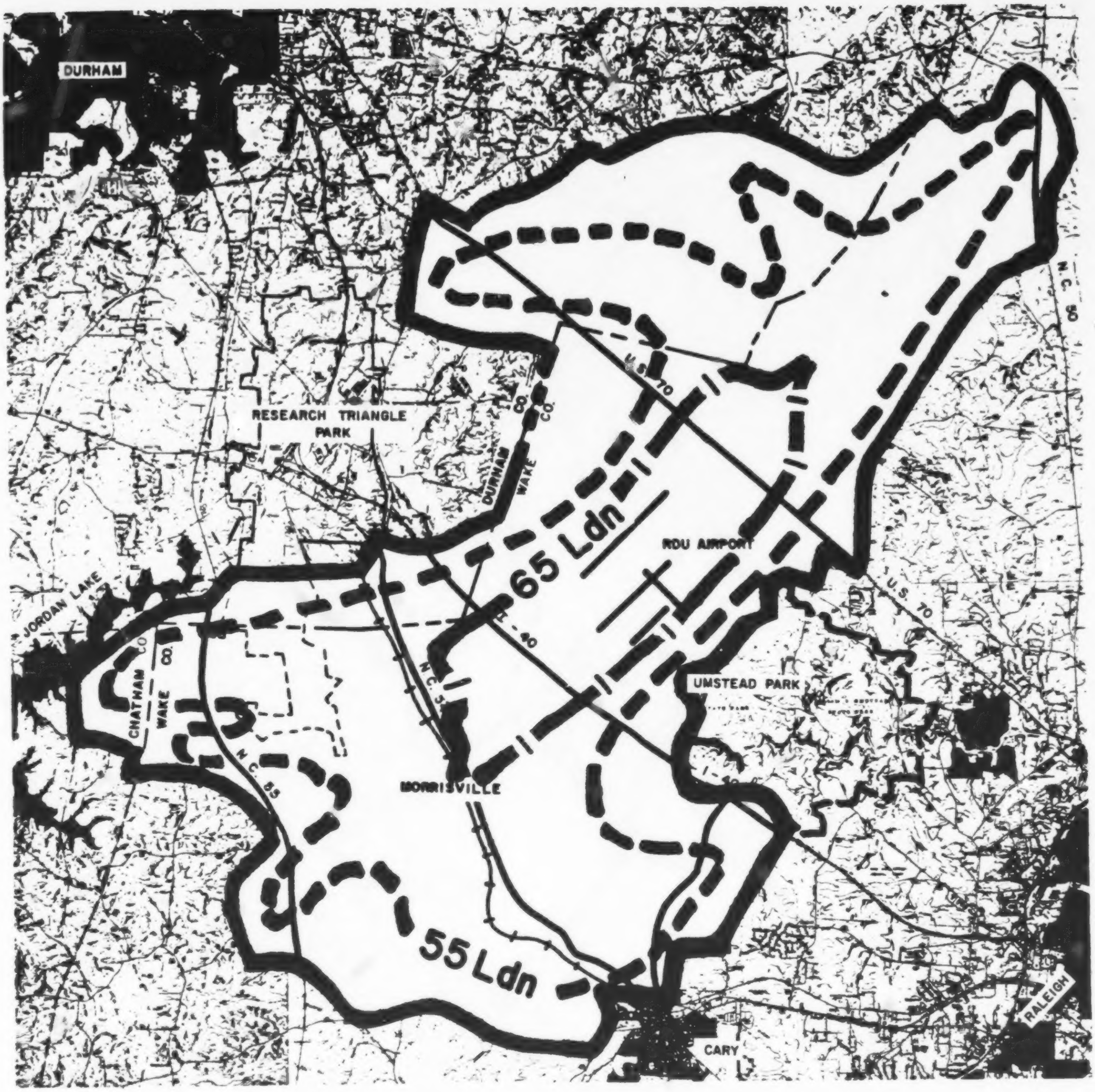
Resolution by the Triangle J Council of Governments
(referring the Plan to affected governmental jurisdictions)

Common Sound Levels
Study Area Statistics



Map 1 RALEIGH-DURHAM AIRPORT REGIONAL SETTING

REGION J
U.S. ARMY CORPS PROPERTY
WATERSHED BOUNDARY
PROPOSED RESERVOIRS
PROPOSED HIGHWAYS
AIRPORT STUDY AREA
N


DURHAM
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
JORDAN LAKE
CHATHAM CO.
WAKE CO.
N.C. 55
N.C. 54
I-40
U.S. 70
N.C. 50
RDU AIRPORT
65 Ldn
55 Ldn
UMSTEAD PARK
MORRISVILLE
CARY
RALEIGH

RALEIGH - DURHAM AIRPORT AND VICINITY

PREPARED BY THE TRIANGLE J COUNCIL OF GOVERNMENTS FROM INFORMATION PROVIDED BY THE PLANNING DEPARTMENTS OF WAKE COUNTY, RALEIGH, CARY, AND DURHAM COUNTY, AND THE TOWN OF MORRISVILLE, THE RALEIGH REGIONAL OFFICE OF THE N.C. DEPT. OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT, AND THE RALEIGH-DURHAM AIRPORT AUTHORITY

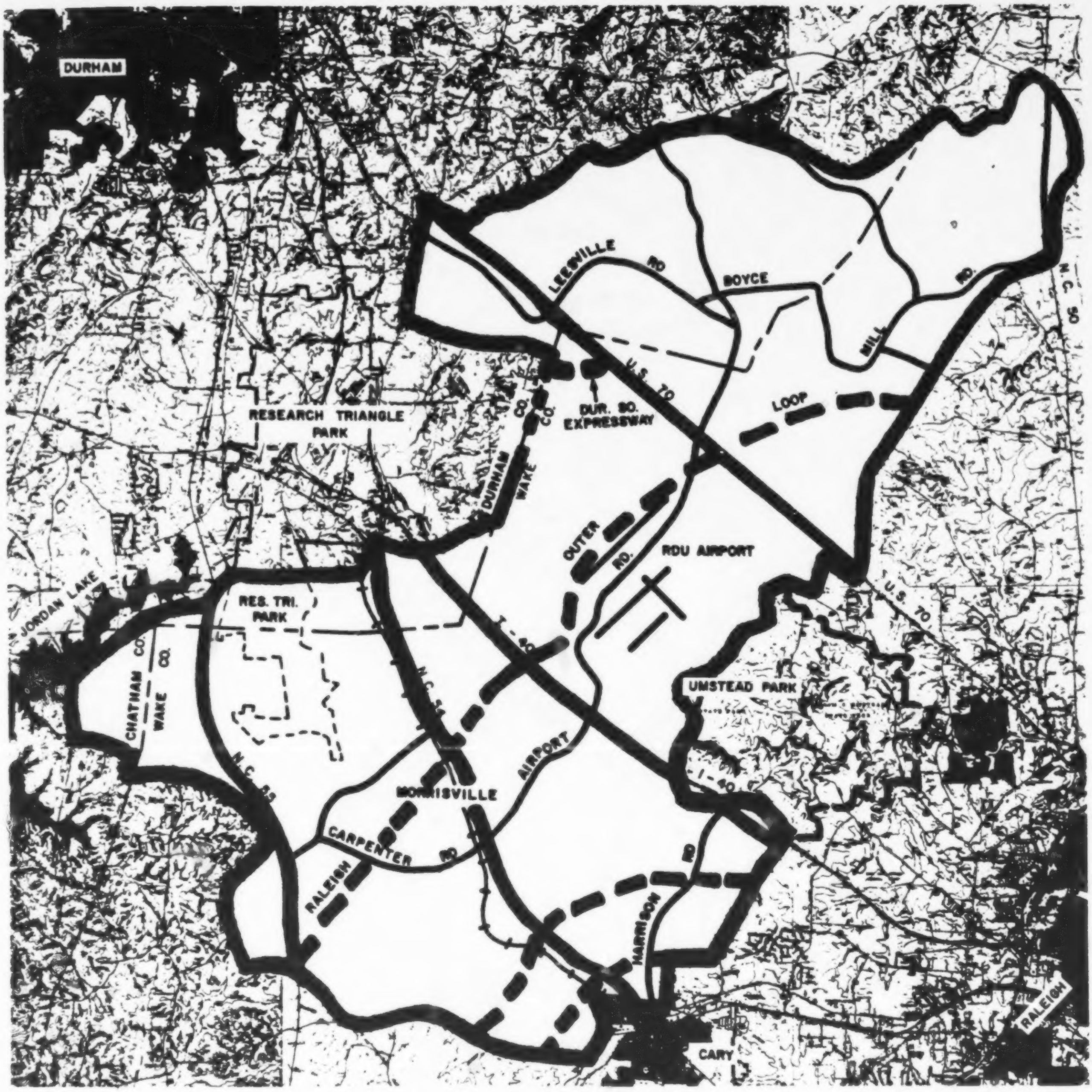
APRIL 1981

2000 1000 0 2000 4000 6000 8000 FEET

1 MILE

MAP 2 NOISE CONTOURS

- ▬ ▬ ▬ 55 Ldn
- ▬|▬|▬ 65 Ldn
- ▬▬▬ STUDY AREA


DURHAM
LEESVILLE RD
BOYCE
MILL RD.
N.C. 50
U.S. 70
DUR. SO. EXPRESSWAY
LOOP
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
OUTER RD.
RDU AIRPORT
RES. TRI. PARK
JORDAN LAKE
CHATHAM CO.
WAKE CO.
I-40
N.C. 54
UMSTEAD PARK
U.S. 70
N.C. 55
MORRISVILLE
AIRPORT
CARPENTER RD
RALEIGH
HARRISON RD
I-40
RALEIGH
CARY

RALEIGH - DURHAM AIRPORT AND VICINITY

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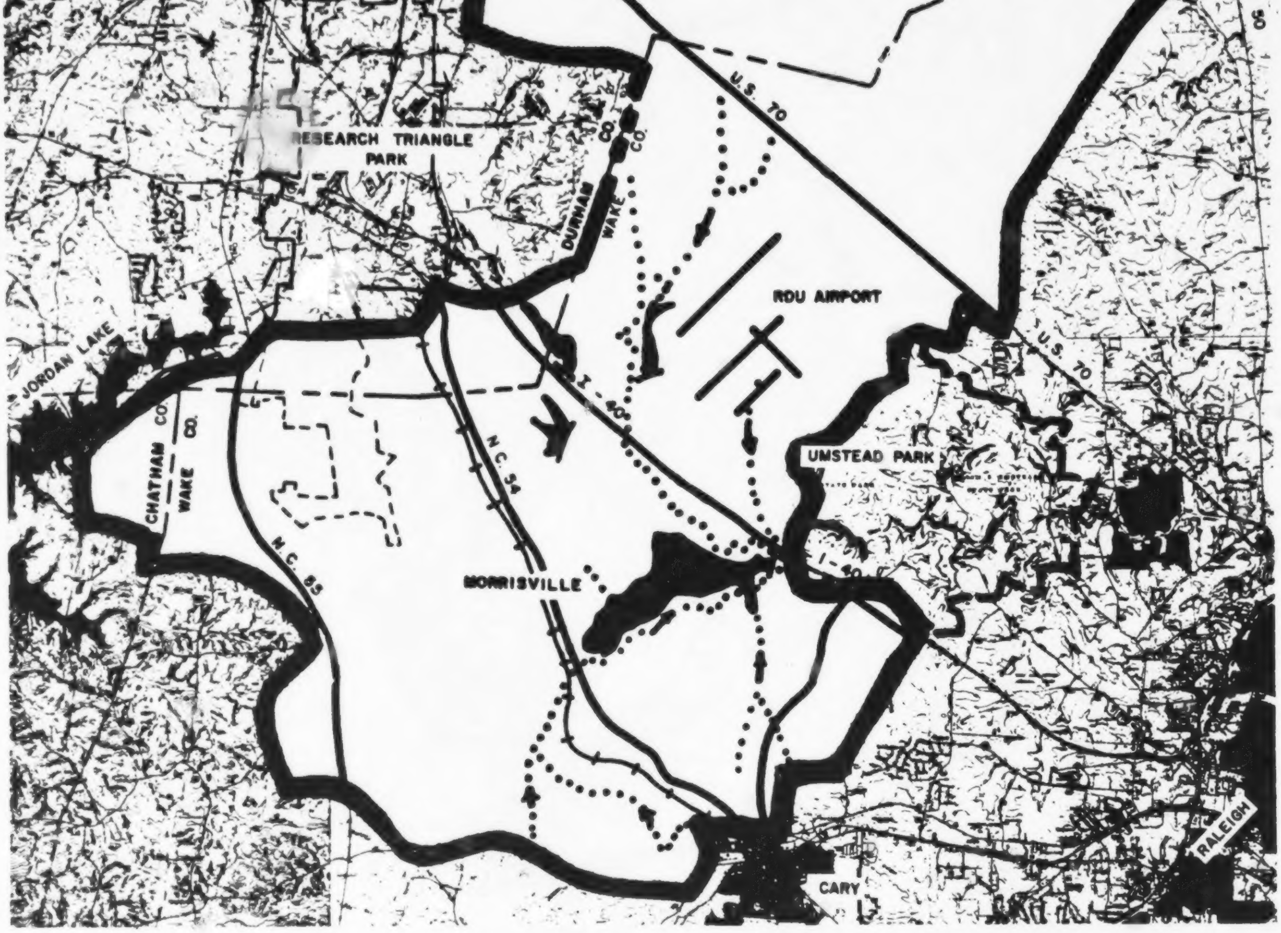
APRIL [illegible]

2000 1000 0 2000 4000 6000 8000 FEET

1 MILE

MAP 3 "MAJOR THOROUGHFARES"

EXISTING	PROPOSED
▬	▬ ▬ ▬


DURHAM
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
U.S. 70
RDU AIRPORT
N.C. 50
JORDAN LAKE
CHATHAM CO.
WAKE CO.
I-40
N.C. 54
UMSTEAD PARK
MORRISVILLE
N.C. 55
I-40
U.S. 70
CARY
RALEIGH

RALEIGH-DURHAM AIRPORT AND VICINITY

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2000 1000 0 2000 4000 6000 8000 FEET

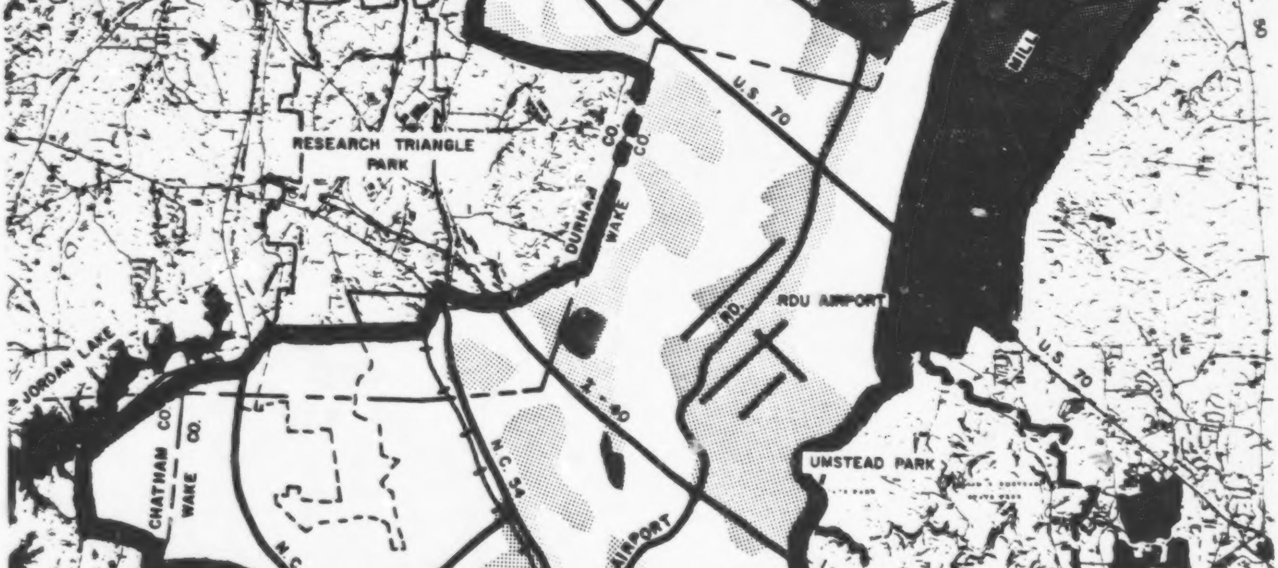
1 MILE

APRIL [illegible]

MAP 4 PROPOSED SEWERS

SEWER LINES ••••••••

LAKES


DURHAM
LEESVILLE RD
BOYCE
MILL RD
N.C. 50
U.S. 70
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
RD.
RDU AIRPORT
JORDAN LAKE
CHATHAM CO.
WAKE CO.
I-40
N.C. 54
UMSTEAD PARK
AIRPORT
MORRISVILLE
N.C. 55
CARPENTER RD
HARRISON
RD
RALEIGH
CARY

RALEIGH - DURHAM AIRPORT AND VICINITY

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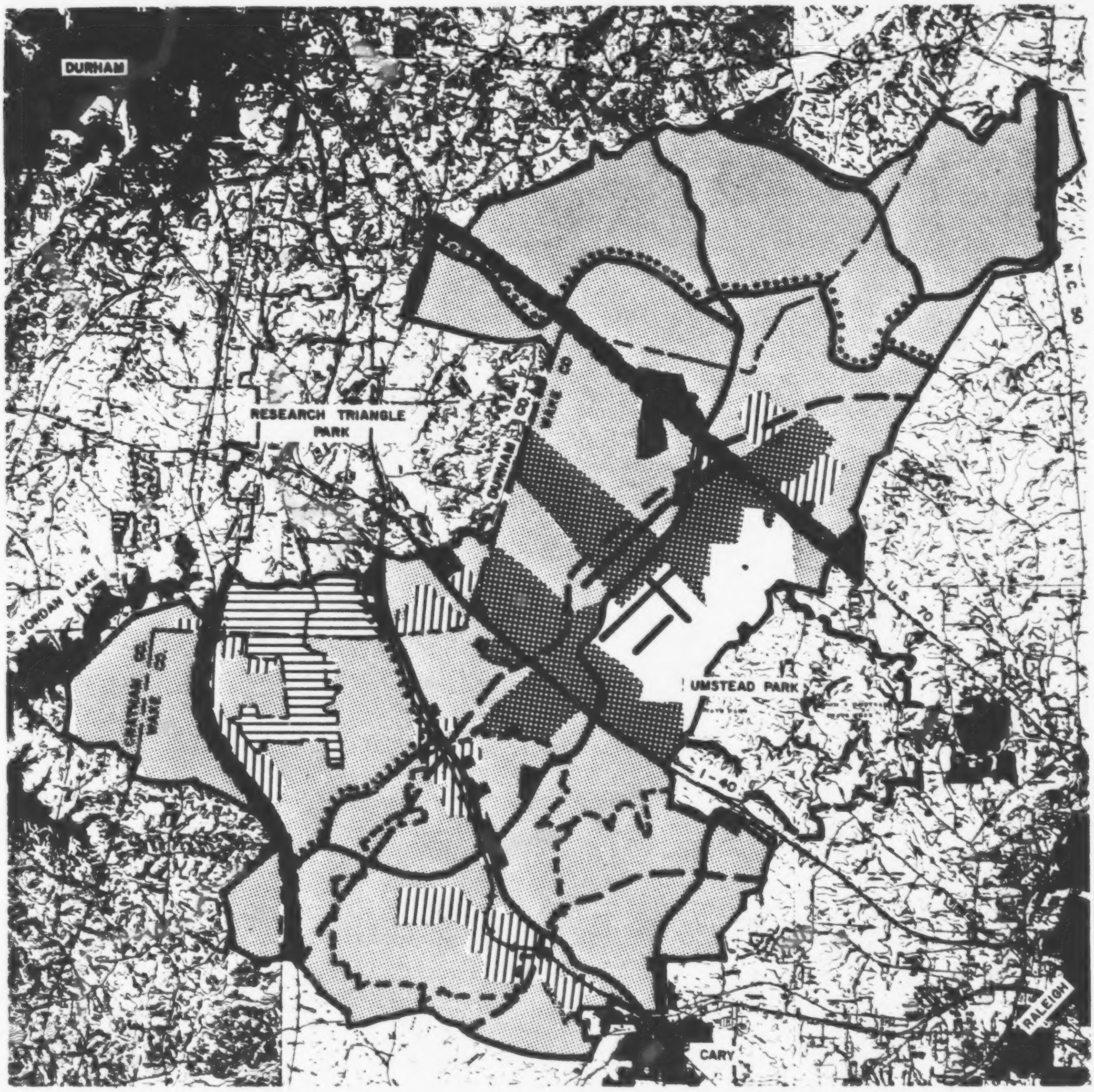
APRIL [illegible]

MAP 5 SOIL SUITABILITY FOR URBAN USES

■ WELL SUITED FOR MOST URBAN USES

▨ SUITED - BUT SEASONALLY WET OR EROSION POTENTIAL

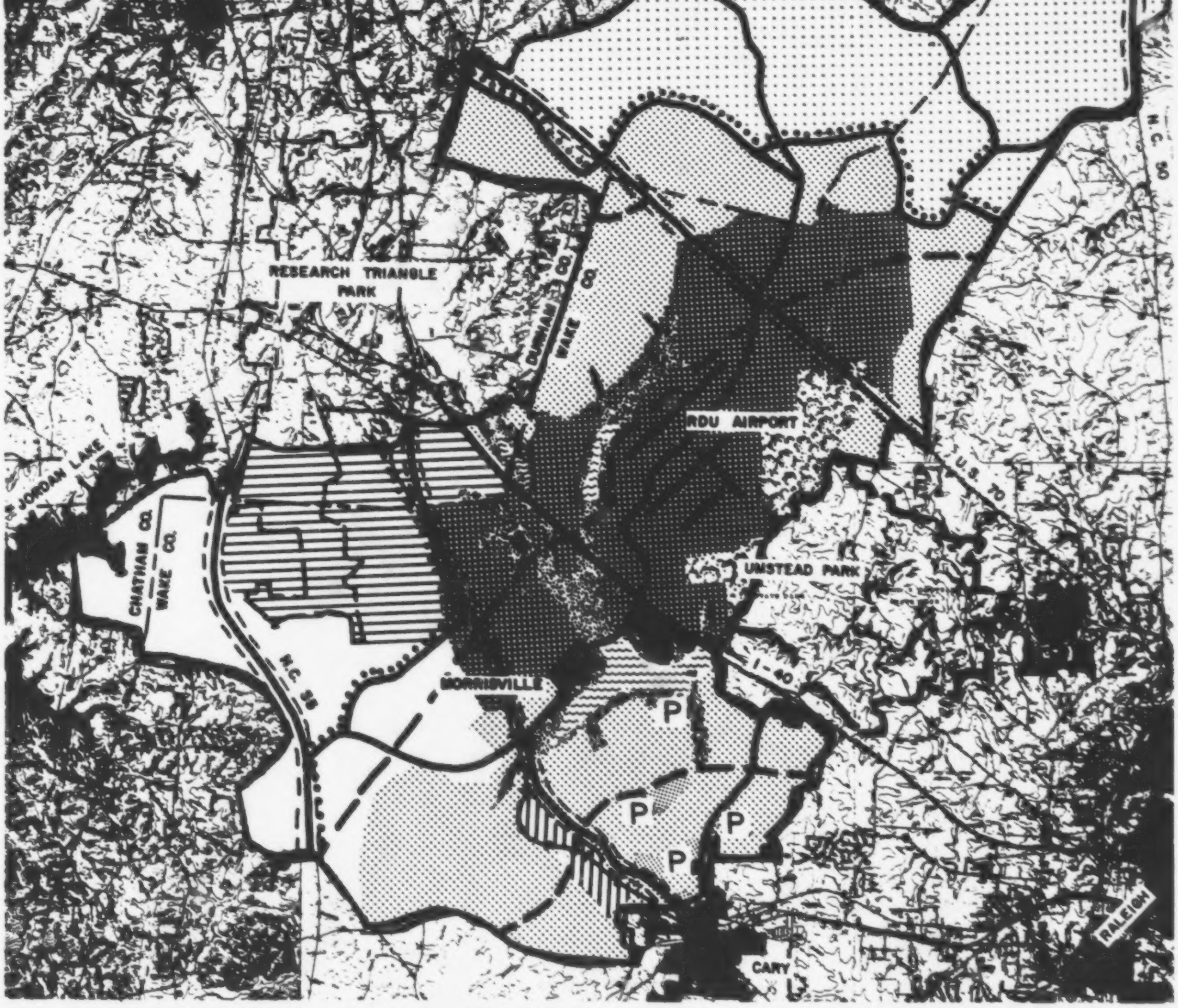
□ POORLY SUITED FOR MOST URBAN USES


DURHAM
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
JORDAN LAKE
CHATHAM
N.C. 50
U.S. 70
UMSTEAD PARK
I-40
CARY
RALEIGH
RESIDENTIAL DISTRICTS
BUSINESS AND OFFICE DISTRICTS
INDUSTRIAL DISTRICTS
AIRPORT DISTRICT
RESEARCH-FARMING DISTRICT
EXTRATERRITORAL BOUNDARIES
RESOURCE AND CONSERVATION
DRAINAGE DIVIDE

RALEIGH - DURHAM AIRPORT AND VICINITY

MAP 6 EXISTING ZONING

F


DURHAM
RESEARCH TRIANGLE PARK
DURHAM CO.
WAKE CO.
JORDAN LAKE
CHATHAM CO.
WAKE CO.
N.C. 55
MORRISVILLE
RDU AIRPORT
UMSTEAD PARK
I-40
U.S. 70
N.C. 50
P
P
P
P
P
CARY
RALEIGH

RALEIGH-DURHAM AIRPORT AND VICINITY

MAP 7 CONCEPT PLAN

PREPARED BY THE TRIANGLE J COUNCIL OF GOVERNMENTS FROM INFORMATION PROVIDED BY THE PLANNING DEPARTMENTS OF WAKE COUNTY, RALEIGH, CARY, AND DURHAM COUNTY, AND THE TOWN OF MORRISVILLE, THE RALEIGH REGIONAL OFFICE OF THE N.C. DEPT. OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT AND THE RALEIGH-DURHAM AIRPORT AUTHORITY.

- ▩ NOISE IMPACT AREA
- ▨ FLOOD PLAIN
- ☰ RESEARCH, FARMING, LOW RESIDENTIAL
- ■ COMMERCIAL, OFFICE, INSTITUTIONAL
- ⁚ RESIDENTIAL, LOW DENSITY
- ▦ RESIDENTIAL, MEDIUM TO HIGH
- ☐ RURAL, INCL. LOW DENSITY RES.
- ░ RESIDENTIAL, LOW TO MEDIUM
- IIII INDUSTRIAL
- ≈ LAKES
- ‒ ‒ PROPOSED THOROUGHFARE
- ━ EXISTING THOROUGHFARE
- ••• DRAINAGE DIVIDE
- ▬ HWY PROTECTION AREA
- P PROPOSED PARK

F

TRIANGLE J COUNCIL OF GOVERNMENTS
100 PARK DRIVE P.O. BOX 12276 RESEARCH TRIANGLE PARK, N.C. 27709 (919) 549-0551

RESOLUTION

WHEREAS, the Raleigh-Durham Airport Authority proposes to construct new runways at the RDU Airport, and

WHEREAS, the new runways will represent a significant improvement, at a substantial cost, of a major regional facility. Because of the large public investment in the Airport, careful planning is needed for the surrounding area in order to adequately protect the Airport from incompatible land uses, and to minimize the adverse effects of airport-related noise on the environment, and

WHEREAS, the Triangle J Council of Governments has convened a planning group made up of representatives of the governmental jurisdictions in the vicinity of RDU, namely the Counties of Wake, Durham and Chatham, the municipalities of Raleigh, Cary and Morrisville, the RDU Authority's staff and the staff of the N. C. Department of Natural Resources and Community Development for the purpose of drafting such a plan,

NOW, THEREFORE, BE IT RESOLVED that the Triangle J Council of Governments accepts the report from the planning group and recommends the plan to be forwarded to the aforementioned governmental jurisdictions for their review.

This the 24th day of June, 1981

Robert B. Heater, Chair

APEX • BENSON • BROADWAY • CARRBORO • CARY • CHAPEL HILL
CLAYTON • DURHAM • FOUR OAKS • FUQUAY-VARINA • GARNER
GOLDSTON • HILLSBOROUGH • HOLLY SPRINGS • KENLY • KNIGHTDALE
MICRO • MORRISVILLE • PINE LEVEL • PITTSBORO • PRINCETON
RALEIGH • ROLESVILLE • SANFORD • SELMA • SILER CITY
SMITHFIELD • WAKE FOREST • WENDELL • ZEBULON
CHATHAM COUNTY • DURHAM COUNTY • JOHNSTON COUNTY
LEE COUNTY • ORANGE COUNTY • WAKE COUNTY

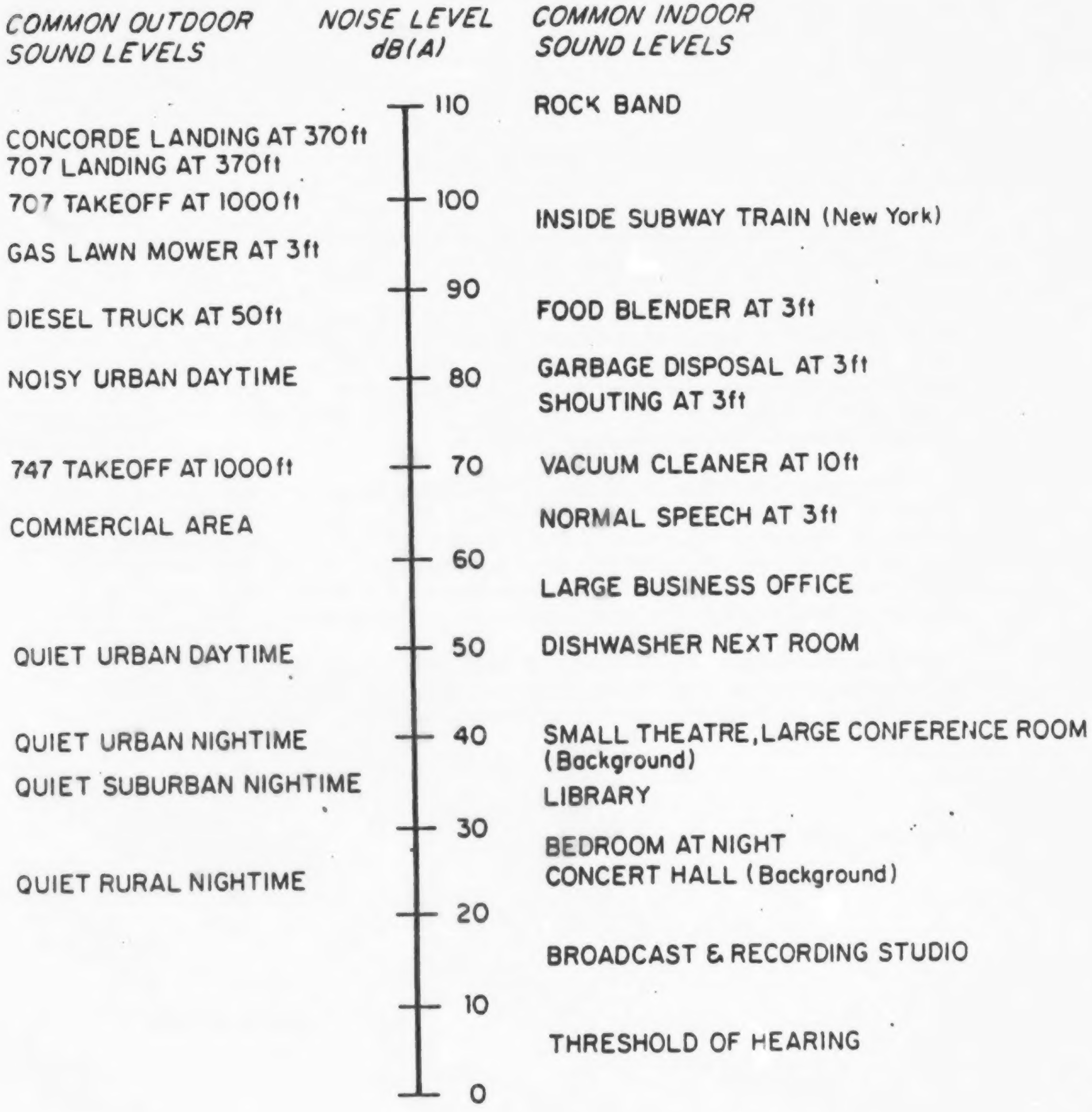

COMMON OUTDOOR SOUND LEVELS
NOISE LEVEL dB(A)
COMMON INDOOR SOUND LEVELS
110
ROCK BAND
CONCORDE LANDING AT 370ft
707 LANDING AT 370ft
707 TAKEOFF AT 1000ft
100
INSIDE SUBWAY TRAIN (New York)
GAS LAWN MOWER AT 3ft
90
DIESEL TRUCK AT 50ft
FOOD BLENDER AT 3ft
NOISY URBAN DAYTIME
80
GARBAGE DISPOSAL AT 3ft
SHOUTING AT 3ft
747 TAKEOFF AT 1000ft
70
VACUUM CLEANER AT 10ft
COMMERCIAL AREA
NORMAL SPEECH AT 3ft
60
LARGE BUSINESS OFFICE
QUIET URBAN DAYTIME
50
DISHWASHER NEXT ROOM
QUIET URBAN NIGHTIME
40
SMALL THEATRE, LARGE CONFERENCE ROOM (Background)
QUIET SUBURBAN NIGHTIME
LIBRARY
30
BEDROOM AT NIGHT
CONCERT HALL (Background)
QUIET RURAL NIGHTIME
20
BROADCAST & RECORDING STUDIO
10
THRESHOLD OF HEARING
0

FIG. 2. COMMON SOUND LEVELS.

SOURCE: Raleigh-Durham Airport Long-Range Development Master Plan and Environmental Assessment, Technical Report, Appendices to Vol. 1 - Appendix H, p. 15. (RDU Airport Authority, March, 1980).

RALEIGH-DURHAM AIRPORT AND VICINITY

STUDY AREA STATISTICS

	Acres	Square Miles
Study area (total area)	48,300	75.5
Wake County portion	35,800	56.0
Durham County portion	11,600	18.0
Chatham County portion	900	1.5
Area within 55 Ldn contour (Map 2)	21,850	34.0
Area within 65 Ldn contour (Map 2)	7,500	11.7
Owned by RDU Authority (within 65 Ldn)	2,300	3.6
Area within proposed "Noise Impact District" (Map 7)	10,300	16.0
Land owned by RDU Authority	4,050	6.3

FLORIDA'S EXPERIENCE WITH STATE REGULATION OF OFF AIRPORT LAND USE

HERB BROWN
FLORIDA AVIATION BUREAU

FLORIDA'S EXPERIENCE WITH STATE REGULATION OF OFF AIRPORT LAND USE

To give you some idea of the, I won't say complexities, but the soul searching that goes on with an ANCLUC program, and having been in it for a few years, I was really startled the past few days because I didn't realize, until now, that these programs couldn't be accomplished because in Florida we have accomplishing ANCLUC programs. I think they have been fairly successful and productive. It does take a lot of soul searching and it does take a lot of honest understanding of all sides of the picture. With that, I would like to go into the nuts and bolts of what we, at least in Florida, go through in a process of developing either a FAR Part 150 or an ANCLUC study.

As we all know, there are federal requirements for noise abatement and of course, in the State of Florida, we have some state authority; but under the Airport and Airway Development Act (Section 18 (a) (4)) which we have used for some years as our Federal authority to develop, first of all, in the Tall Structure Program, ordinances to control tall structures throughout the State and with the advent of ANCLUC studies we have used this law to comply with the requirements of Section 18 (a) (4), in that local jurisdictions did everything they could possible to ensure compatible development around their airports. Under the Aviation Safety and Noise Abatement Act of 1979, specifically 14 CFR 150, I think the Feds have a good program. The law is good and I think the way that people use the law, interpret it, and implement it, is the basis for its success. The law in it self is not going to do much. But, individuals can, and I think increasingly are, working through this mechanism to ensure that compatible land use plans are developed and implemented.

In the State of Florida, we also have the Local Comprehensive Planning Act. We've used this, literally, to piggyback on in that in most states it is difficult to get new legislation through, particularly in a pure form, so what we've done is to use this law to say "okay" when we develop a FAR Part 150 plan, it will serve two purposes. First of all, obviously, to meet the Federal requirements under FAR Part 150, but it will also be used as an element in the comprehensive plan and under that Subsection there are provisions requiring that communities over 50,000 have a transportation element within their Comprehensive Plan. Actually, what we are doing is piggybacking on an existing law rather than trying to go through the legislative process and get a law that would more nearly fit what we are trying to achieve. We've also, since 1975, had an airport zoning law. This deals strictly with tall structures and while they are, as we all know, of similarity with land use compatibility around airports, it is really more than we are going to deal with in this presentation.

I'd like to say that we now have three (3) approved studies under the ANCLUC program in the State of Florida. Orlando International Ft. Lauderdale-Hollywood International and Pensacola Regional airports. I'd like to stop for a moment and say from the onset that merely developing a plan under FAR Part 150, while it may be necessary, is only the first step. You need to implement the plan. Merely having a plan on a shelf by itself is really not going to do much. You need to implement it and you need to get community support behind the plan. Several of these airport plans that are on-going are general aviation airports. Daytona Beach, at the time that we made this slide, was in a process of applying for funds. As we all know, those federal funds dried up, so it's an on again, off again situation. They are going to do the plan but we don't know when. On the other hand, we have several airports that are standing in line waiting to have the studies done. I think the reason that they are standing in line, and we really haven't brought them on-board is simply lack of funds. There are no funds available, as we all know, particularly at the state and Federal level. In those cases where there is expertise in the city and the county planning department, they have dealt and relied very heavily on this expertise to actually write the plans with my help and guidance. I do this for two reasons. First of all, I obviously can't have eight or nine studies ongoing and do them all at the same time. Second of all, if the cities and counties are involved in an in-house study they are more apt to implement the study, they have their finger on a pulse of what's going on, they are closer to the grass roots level, and by having them actually be a part of the study in all cases so far they have been very receptive to implementing the study once it is completed.

I would like to share with you what we work towards in an ANCLUC study. Whether we are doing an ANCLUC study or a FAR Part 150 study the basic concepts are really the same. In establishing committees, and I know we talked about committees this morning, I think they are essential. Two committees should be formed, first the policy committee. The makeup of this policy committee the decision-makers of the community. As we all know, the airport proprietor really doesn't have much authority for off airport land use. He has nearly as little authority in any operational criteria as far as airlines go. He has an input; but in the decision-making process you need your elected representatives, county commissioners, city councilmen, city and county attorneys, and particularly the city managers and county administrators. These are the people that actually form this policy committee. They not only give us guidance as to what the cities and counties could live with, but they also, once the plan has been completed, have been part of the planning process and when it comes time to implement the study they know exactly what it is and can go to their colleagues and carry the plan through the adoption process. This is true whether it be an enabling ordinance, rezoning or whatever comes out of the study. Likewise, the technical coordinating committee is comprised of two subcommittees. There is an operational aspect and a land use aspect. I think it would be unjust to say that one is more important than the other. When we start a study of this type, nothing is sacred except the FAR established instrument procedures for the airport. That is the only thing that is sacred. Everything else is open to challenge. It's open to change and whatever is determined to be best to suit the airport operation to minimize noise impacts. In this respect we have an operation subcommittee which looks at the operational aspects of the airport. How can flight tracks be changed -- both the departure tracks and the arrival tracks? Mostly arrival tracks that can be changed would be under VFR conditions because we do stipulate that the IFR procedures remain intact. The public involvement subcommittee is just as important, or maybe even more important because these people make up not only your city and county planning and zoning people, but we also try from day one to identify and bring into the study, every adversary group that we know about. The reason we do this is that it is better to deal with the adversary groups from day one than it is to try to bring them onboard after certain decisions and conclusions have been arrived at. We look mainly to the real estate groups. We also look to the home building association. We look to groups living around the airport particularly those groups that have a vested interest in airport noise abatement. We identify these groups and we bring them onboard from day one. Believe me, the first few meetings of any such study, to where everybody gets pointed in a common direction, are really soul searching. Many times people go off shaking their heads, shaking their fists, and saying this just absolutely won't work. But, it will work. It is a matter of communication and a matter of understanding. Study after study, I have found that bringing the adversary groups onboard initially is much easier than when they throw stones from the periphery. It is better to be a part of the study; to have an input to the study than it is to sit back and throw stones at a study when you have been a part of it is much more difficult. While it is much more soul searching at the beginning of the study to have adversary groups involved on a long-term basis it is really more productive.

In developing a comprehensive plan we first complete a noise model. In the State of Florida, because of it being tied to the comprehensive planning process (which is projected out to twenty years) we also try to project our plan for twenty years. The master plan is, of course, also projected to twenty years. We all know that anything beyond 3 to 5 years is a WAG. But, what we try to do is use the best data that we have from a master plan, from airlines or from tower statistics, anything that we've got to come up with valid raw data in modeling our computer program. We developed the noise contours out to 65 Ldn because, quite frankly, we haven't fallen into the problem apparently that most states throughout the country have fallen into, in that anything beyond 65 Ldn people really haven't complained about. One point in this effort, and this actually happened in my home town, where during the tourist season they have had an influx of business jets. We have a radio station there that has a talk show in the afternoon. It just so happened that one afternoon I was listening to this talk show and the night before the local newspaper had a large article about airport noise and how these business jets were increasing the airport noise. A lady called on the phone, very irate, and said, "I've lived here for over terrible. It's got to stop." She said, "I've lived here for over 50 years and I just can't stand it." The radio announcer asked her, "How long has this been bothering you?" "How long has it been going on?" She answered "Well, it's been bothering me ever since I read about it in the newspaper last night." This actually happened. So, it is a perception. Whether you have an international airport where people are living in the 80 dBA or Ldn noise contours, and we do have some of those in Florida, or whether you have a general aviation airport where people are living in the 60 Ldn; if they perceive this noise as a detriment to their well-being; then they've got a valid issue. How valid and how rational you can deal with this is really a subject and part of this study. It is something that through an educational process normally you are able to deal with and, believe me, the only way you can deal with it is with honesty. Honesty is the key to the whole thing because if you are not honest, in a lot of cases, it will come back to haunt you. You have got to be honest with the people and tell them the facts rather than what they would like to hear. This is why at each of the meetings I go to I bring at least three extra pairs of ballet shoes and I keep moving because it isn't always the easiest thing to do but in the long run it is the best.

We also look at the airport operational procedures; the runup areas, the taxi procedures, preferential runways, arrival procedures from a VFR standpoint, departure procedures, both closed traffic in a training situation, or departure procedures, (VFR), (IFR); we look at all procedures. We try to come up with a method that will not only minimize the noise but will be as efficient as absolutely possible as far as operating procedures. It has got to be safe, it has got to minimize the noise impact, and again, this is something that is soul seaching. This is why you have the people representing air carriers or representing general aviation; the people that operate the airplanes, and the technical people that can sit down and evaluate what the procedures are, what they could be changed to, to minimize this noise impacts and in most cases even in general aviation airports we have been able to very graciously bring the FAA in and come up with informal operating procedures. They have been very good about working with us in coming up with informal agreements even in a case of actually changing a departure route and procedures both at the local FAA level and at the regional level. By working and coordinating these efforts, we have been able to achieve reduced noise levels. On the other side of the coin, we look at the compatible land uses and we find out what are compatible with the airport and what are not. I won't get into it at great detail, but those areas that are found to be incompatible we set up a mechanism in our enabling ordinances to allow the owners of the property to develop their property. We give them options to develop. For each option there are certain restrictive criteria that they must adhere to. We feel, and the property owners so far have felt that this would not come into any adverse incondemnation procedures and that there is enough latitude to develop their property to its highest and best use. Again, we've done this in a manner to say that if you want to develop your property in a specific way then you must adhere to these certain restrictions that are put on the property. For example, if they want to develop it residential, they must adhere to the HUD criteria under 24 CFR 51 and they must reduce the noise, they must give disclosure statements and in some cases they have even been willing to grant avigation easements. As we all know, navigation easements normally don't come cheap but we have been able to work with the people and have very successfully•received restrictive covenants in the deed to assure that, from an airport standpoint, they are protected and by putting sound level reduction methods in the construction of houses and through disclosure statements, give a measure of protection to the people that would be purchasing the houses. We look at both sides of the coin again and try to protect the entire community, not just one segment of it. Then, finally, in developing enabling ordinances once this plan is done we have to have something to implement it and we have used this ordinance. I won't go into the first part since it does deal strictly with tall structures, but in the second part we identified the noise zones and we do this through a legal description. As we all know, noise zones differ as do temperature, atmosphere, etc. If you just use the raw data that is developed on a computer it would be difficult to substantiate it in litigation. What we do is to use a legal description. In cases of undeveloped property we may go down a quarter section, through developed property we may go down through streets, even down through lots, to ensure that there is no remnant parcels, to ensure that no subdivisions have different restrictions on zoning. Actually, the legal description approximates the noise boundaries as close as possible but it does meander. In most, if not all cases, it is more restrictive than the noise boundaries but we try to adhere to those predictions as close as we can.

Let us say for example if you want to develop residential areas in the 65 Ldn, as long as they are not in an accident potential area you may do so as long as you put in noise reduction construction techniques that will give you a sound level reduction, some cases 25 dB, some cases 30 dB, and some cases 35 dB. We differentiate these by saying that to develop there needs to be a site specific analysis and during that site specific analysis we then say, because your house is located closer to the center line of the runway even though it is in the 65 Ldn area you will have to take certain specific measures. If it is in the periphery you will have to take certain other measures. This is all stipulated in enabling ordinances so it is very definitive in trying to take all these subjective rationale out of this decision-making process.

The sound level requirements are also in the ordinance and we have again, through a committee, based on architects, building people, and specific materials, have come up with a set of criteria, for the State of Florida, that will actually reduce the inside noise level 25, 30, and 35 dB by using these certain type of construction techniques. This again is in the ordinance, and since a lot of the building inspectors that will have to enforce the ordinance really are not cognizant of all the acoustical criteria can look and say, if you use 1/4 inch stripping, if you put in double pane windows, it will do certain things and if they meet this criteria then thats fine. They have, in all practical purposes, adhered to the ordinance and will reduce the inside noise levels. If an architect comes in and decides that he does not want to conform to this, then there is a provision in the ordinance for an acoustical consultant to certify that his design will meet the criteria of the ordinance. This is also fine as long as we can give some protection to the person that is buying the house and the fact that he is aware of it. In the disclosure statement or notification of potential noise impact, we go along basically with the criterion of P.L. 96-193 but we expand on it. I don't really feel that just publishing a map in a newspaper for three times is really going to meet the needs of the general public even though it might meet the intent of the law. For example, if somebody wants to buy a house a year from the time that the last newspaper was published, they may not be knowledgable of this. So, what we do is to have the maps that are published in the newspaper available to the realtors, available to city and county planning agencies, and because we have a Truth In Sales law in the State of Florida that the real estate people particularly come under, we encourage the real estate people to divulge to the perspective buyer that they are in a noise impacted area. Now, again, the real estate and community have gone along with this. They have been receptive to it, though they were not overjoyed. We initially took the position that we wanted a disclosure statement signed by a perspective buyer but that went over like a lead balloon because they felt that this created a stigma on the potential property. So through negotiations we agreed that given a noise impact map showing where in the noise impact area their house or potential property was located would suffice.

I'd like to go thru what we did at Pensacola Airport. Pensacola, for those of you who do not know, is a regional airport even though there are a few air carriers operations. It is basically a general aviation airport. Gulf of Mexico South, the Naval Air Station at Pensacola which has very heavy military flying is just at the Southwest of the airport. The airport itself is oriented -- runway 16/32 is a 7,000 foot runway, and 7/25 is a 6,000 foot runway for cross wind. In looking at this, we decided that for departure traffic, we would give them two options, to climb straight out or if they were going to turn not to make their first turn until they got over this abandoned airfield at the navy strip which is about 2 miles out. This area is mostly commercial with houses in this area, but commercial strip through here. At a two mile point over this they would turn out over Escambia Bay. Departing on runway 16, likewise, they would come out to the marker and make a turn out over the water. Departures on runway 25 would be restricted to only light general aviation aircraft and only on those times that the wind would prohibit use on any other runway. Departures on runway 7 would be obviously out over the water either to the North or the South, whichever they desire for a flight track. Basically, what we came up with for departure procedures, and we did coordinate this with the FAA and came up with an informal agreement which changed quite a little bit from what had been ordinarily done I think, as you will see, it has enhanced it. The projected noise contours for the airport using runway 16/32 as a primary runway you can see the 75 Ldn noise contour in red substantially off the airport. The 70 Ldn contour is depicted in yellow and 65 Ldn is depicted in blue. We are talking now about 4 to 5 miles out to the North so you can see it is substantial. This again is depicting it as it will be using the traffic allocation 16/32 as the primary runway. As a result of the study we felt that to minimize noise impacts we would get aircraft out over the water as fast as possible so we designated runway 7 as a preferential departure runway. It had already been indicated in the master plan that that would be extended to a total of 7,000 feet and would not only accommodate all of your general aviation aircraft but would certainly accommodate your air carriers, even your wide body; this was already approved in the master plan. We capitalized on this and said let's designate this as the preferential runway and you can see how dramatically it brought the noise contour in. It did expand it out over this area and, as a side light to this, what happened when we went through the whole planning process and as I mentioned earlier, we brought all of the adversary groups that were known to us in to the planning process early. What happened when we went to public hearings with this new concept, all of the people living in this area needless to say were upset. It just so happened that all of these houses, $250,000-$300,000 houses in the most affluent area of the whole city, were affected as you can see by the expansion of the noise contour. It was shelved. It was absolutely shelved. We almost got tarred and feathered at the public hearing. What we did was to go back into our meetings. We went back to the community and we held two public information meetings, 400 to 500 people showed each night and each meeting took four hours and a lot of grey hair. We later went through the whole planning process with these people and we were very candid and very honest with them and we tried the best we could to accurately answer their questions and address their concerns. As a result of this, there was some minor changes in proposed land use zoning that they recommended but basically after two informational meetings they understood what we are trying to do. We went back to public hearing and the same people that had run us up out of the city council chambers came in with a petition with some 283 signatures supporting our planning effort. This happened only through an educational process and believe me these were people who were doctors, lawyers, community and civic leaders. We showed them how by changing this around we would get the airplanes out over the water and this would reduce the impact on the communities (reducing the impact on well over 700 residents). If I recall correctly, these houses were substantially better insulated and better constructed and for the single event noise level of 4 to 6 seconds they would be really impacted in that it was improving the entire community. By doing this, I'll be honest they didn't like it but they understood it and they agreed with it and accepted it. It has become an approved plan. It is no easy task but once people understand it, assuming they are rational, you have a good plan and they will buy it. We realistically wanted to deal with these people. They had a problem. The whole city had a problem with inverse condemnation. As a result of this study, we did go back and agree to purchase this land, substantial acreage, and decided since it was so much money for the city, how can we minimize the impact and still benefit the community with out just leaving it dormat. The city is in the process of negotiating to sell their golf course and relocating it in this area. This will not only be compatible with the airport but will also benefit the surrounding neighborhood. So, through this process we were able to use the land in this case in the highest and best use and were able to open up some other property for residential development. Even if you want to call this transfer of development rights, still all in all we've been able to use it. The red area (an established shopping center) we felt that because of this highway and as a buffer between airport they would use it as an office park and, to be pleasing to the community, it would buffer this residential, it would be acoustically designed so it would meet the noise continuation standards and still provide benefit to the community, stay on the tax rolls and all of those things that really should be done. The areas in here, by necessity, we had to rezone those as light industry and the city is working now on trying to get some companies to come in and also be compatible with the airport. They know the noise is there and would not interfere with their operation yet be agreeable to the surrounding community. This area in here, besides being quite a bit of marsh land, to keep from rezoning it to try and develop or fill in residential units, you must give disclosure statements and must attenuate your noise adequately to insure reasonable comfort to the people that buy the houses and who will live there. In order to do this we have come up with a plan that has worked and been approved. An enabling ordinance is going through the public hearing process and having the public totally supporting it there has been no dissent across the board. It is very interesting because about 6 or 7 years ago the word zoning was a nasty six letter word in this country. People have been thrown out of office for even mentioning the word but now through understanding, through some realistic planning, they have been able to accept it, approve it, and I think it is going to benefit the entire community, not just the airports.

EVOLUTION OF A STATE AIRPORT LAND USE COMPATIBILITY PROGRAM: THE ARIZONA EXPERIENCE

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I. ABSTRACT

The Transportation Planning Division of the Arizona Department of Transportation is pursuing an airport land use compatibility program which emphasizes public education, technical assistance to airport operators, review of local land use decisions and coordination of aviation planning projects with other planning programs. During the last three years, the Division has attempted to lessen airport noise impacts and to encourage local governments to consider airport land use compatibility in their local airport and land use planning decisions.

The Division's airport land use compatibility work program is intended to implement the State's goal of trying to achieve compatibility between Arizona airports and adjacent land uses. This goal is supported by several objectives; all contained in the Arizona State Airport System Plan. In order to realize these goals and objectives, the Arizona DOT has used both Federal and State resources to fund Airzona's airport land use compatibility work program. This paper will document the completed projects as well as planned elements being considered by the Arizona DOT.

II. BACKGROUND

Airport noise has become a major issue in airport planning. In recent years, considerable public attention has been directed to the problems that airports have experienced in living with their neighbors. The positive far-reaching benefits of aviation are sometimes diminished by less favorable airport noise side effects which may occur as a result of increased aircraft activity in or around existing airport facilities. In addition, public concern over potential noise impacts has made the selection of new airport sites increasingly difficult.

In 1969, the U.S. Congress recognized the serious nature of this problem and established noise standards for the certification of new aircraft (FAR, Part 36). Numerous Federal actions to abate airport noise followed. The Federal Aviation Administration and the U.S. DOT, in 1976, issued a joint policy statement which encouraged airport sponsors to develop comprehensive noise control plans for their facilities. Later, the FAA prepared airport land use compatibility guidelines to assist airport sponsors in achieving compatibility between their airport and its environs. The FAA also recommends that a State Airport System Plan (SASP) should incorporate concerns over existing or potential environmental related problems (noise is currently the most significant). Even though the airport sponsor, according to the FAA, has the prime responsibility to address airport noise problems, the State should not fail to address airport noise issues in its SASP.

The first Arizona State Airport System Plan, prepared in 1973, expressed a State concern about airport noise problems. However, the plan only considered airport noise after the development of the recommended system. By 1977, the Arizona DOT recognized that this plan had become obsolete. The State's population and aviation activity changed dramatically, yet the Arizona DOT hadn't developed a continuous airport planning process which could react to these changes. Consequently, the Arizona DOT sought financial assistance from the Federal Aviation Administration to prepare an updated State Airport System Plan. Consistent with earlier State transportation planning programs, the Arizona DOT proposed to utilize its own staff to prepare this system plan. This decision helped to shape the content of the Department's airport land use compatibility planning program.

Several other key decisions also helped to support a State concern over airport noise problems. The Arizona DOT recognized, in the early stages of its airport system planning program, that the achievement of compatibility between Arizona's airports and adjacent land uses is a goal that can help to define the overall direction for the State to pursue in support of aviation and the environment in which it operates. This realization represents a very fundamental change in attitude by a State transportation planning agency.

This change in State aviation planning philosophy permitted the Arizona DOT to undertake a major effort to implement a state airport land use compatibility program. Arizona's commitment to lessening airport noise impacts includes not only goals and objectives in its State Airport System Plan. Specific implementation activities were explicitly formulated and formally incorporated into the State's continuous airport system planning process. Finally, the Arizona DOT has also, after the expiration of FAA-airport planning funds, utilized State monies to fund in-house projects, as well as local airport planning projects that included airport land use compatibility concerns.

III. STATE AIRPORT LAND USE COMPATIBILITY PROGRAM

A. State Airport System Planning Program

The Arizona DOT believes that its State Airport System Plan is not only intended to provide a plan for the development of an airport system. The plan should also identify and recommend ways to mitigate potential negative impacts. Noise is currently the most negative airport impact. Excessive noise can lower the quality of living environments and may cause people to file lawsuits against airports. Finally, the development of noise sensitive uses around an airport may also create problems for the future expansion of the airport. In effect, the State's system of airports must be able to satisfy current and future aviation demand while providing the maximum amount of freedom from noise impacts for the people who live, work, or own property near these airports. The Arizona DOT's goal to achieve airport land use compatibility not only indicates the Department's concern over the social impacts caused by noise, but it also points out the Department's concern with protecting its financial investment in the State system airports. Reductions in airport capacity or premature closure of an airport is a waste of a valuable public investment. In addition, this goal shows that the Department is also interested in assisting local airport operators in meeting Federal requirements and in implementing airport land use compatibility plans.

In order to achieve this goal, the Division, with the advice and assistance of both technical and advisory committees, developed the following objectives.

- Assist airport operators in ensuring compatible land uses on State and Federal lands surrounding airport sites.
- Support the development of airports at sites where adjacent land has been reserved for uses compatible to aviation.
- Develop aviation facilities and services at locations where noise and other environmental impacts are minimal.
- Develop aviation dependent industry adjacent to airports.
- Establish methods to eliminate existing and prevent future encroachment of incompatible land uses adjacent to airports.

These objectives further define the direction of the Arizona DOT's airport land use compatibility program. At the same time, the goals and objectives point out specific issues that the SASP needs to resolve.

Finally, the SASP proposed alternative policies which the State could undertake to improve land use compatibility throughout the airport system. The proposed policies include the following:

1. Place conditions on State grants in aid to airports with severe noise problems to ensure efforts to eliminate the problem. It will be the responsibility of the grant applicant to demonstrate the extent of any noise problem and to suggest methods by which this noise problem can be eliminated.
2. Place emphasis in the five-year Airport Development Program on land acquisition to promote airport-land use compatibility.
3. Investigate and support methods to obtain airport land use compatibility. Specifically, ADOT will seek and support land use controls necessary for counties, municipalities and/or airports to achieve airport-land use compatibility.
4. Provide technical assistance to airport operators to promote airport-land use compatibility to the extent that resources permit. Specifically, ADOT will provide assistance to airport operators in ensuring land use on State and Federal land surrounding airport sites.

5. Encourage monitoring of heavily used airports to identify potential noise problems.
6. Encourage adequate clear zones, and the elimination of obstructions at all Primary System Airports.
7. Encourage an airport-land use compatibility element in all Master Plans.

These airport land use compatibility goals, objectives and policies can be translated into specific plans and projects. In effect, the Arizona DOT established a "systems analysis" approach to the airport noise problem. The process which the Arizona DOT developed for preparing its Airport System Plan permitted the staff to incorporate land use compatibility and airport noise concerns at repeated intervals rather than at the conclusion of the plan. This analysis took place at the following intervals: 1. state profile; 2. goals and objectives; 3. aviation policies; and 4. alternative evaluation. The complete Arizona airport system planning process is shown in Figure 1.

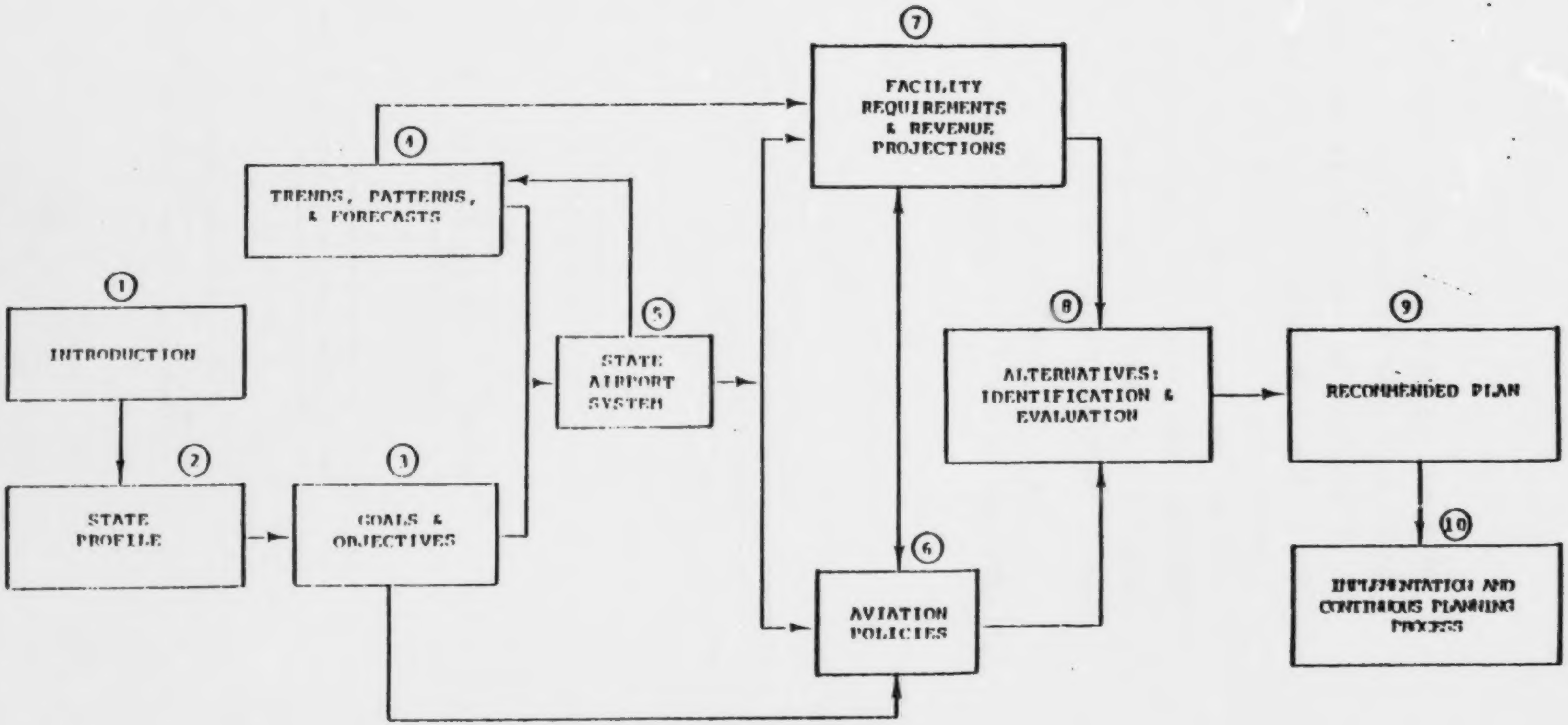
The Arizona State Airport System Plan, which was completed in July 1978, illustrates how a state can use Federal assistance to establish a new planning expertise. The Arizona DOT used Federal dollars to support the rather expensive "start-up costs" necessary to enable the State to do aviation system planning as well as airport land use compatibility planning.

B. Continuous Airport System Planning Process

In 1978, Arizona completed its Second State Airport System Plan. As stated earlier, the original

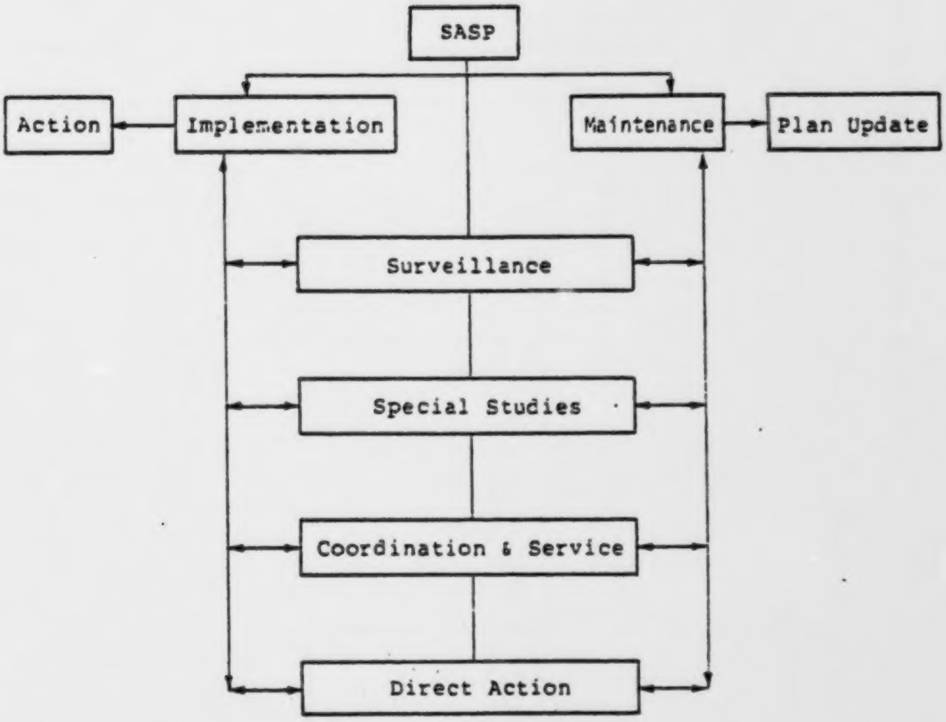
FIGURE I

STATE AIRPORT SYSTEMS PLANNING PROCESS


①
INTRODUCTION
②
STATE PROFILE
③
GOALS & OBJECTIVES
④
TRENDS, PATTERNS, & FORECASTS
⑤
STATE AIRPORT SYSTEM
⑥
AVIATION POLICIES
⑦
FACILITY REQUIREMENTS & REVENUE PROJECTIONS
⑧
ALTERNATIVES: IDENTIFICATION & EVALUATION
⑨
RECOMMENDED PLAN
⑩
IMPLEMENTATION AND CONTINUOUS PLANNING PROCESS

SASP had become obsolete. This obsolescence was no doubt hastened by the absence of a continuous planning process to sustain its currency. At the same time, the Department failed to implement any of its airport land use compatibility policies. Upon completion of the second SASP, planning efforts shifted to implementation and maintenance of this plan. This included a major effort devoted to improving airport land use compatibility.

The Arizona Continuous Airport System Planning Process (CASSP) is graphically shown below.


SASP
Action
Implementation
Maintenance
Plan Update
Surveillance
Special Studies
Coordination & Service
Direct Action

The Department considered for implementation numerous projects which included activities in the following areas:

1. Strengthening municipal and county planning and zoning powers,
2. Changes in Arizona DOT's programs and procedures, and
3. Intergovernmental coordination.

Airport land use compatibility projects can be easily incorporated in the Department's continuous planning program as part of one of the following program activities: 1. Surveillance; 2. Special Study; 3. Coordination and Service; and 4. Direct Action.

Special studies, direct action and coordination and service projects represent implementation measures, while surveillance projects will help to keep the SASP current.

- Fiscal Year 1979 -

During the first year of the Arizona CASPP, Arizona completed several major compatibility projects. The Department funded a special study to research airport noise which also included alternative methods for resolving airport noise impacts. The results of this analysis is summarized in a public information brochure entitled, Planning and Airport Noise Impacts. The Arizona DOT wanted to increase the public awareness of airport noise, as well as to encourage airport sponsors, local government officials, and planners to try to prevent or correct airport land use conflicts. Thus, the Department distributed this report to all of Arizona's airport managers, planning directors, and local governments.

Another special study, which the Arizona DOT completed, identified potential airport obstructions. This report also suggested corrective measures to mitigate these problems.

The Arizona DOT started an airport land use compatibility surveillance program which included state review of local airport master plans. This review included the evaluation of airport noise analysis, land use information, obstructions, as well as the plan's overall consistency with the Arizona SASP's goals, objectives and policies. The Arizona DOT reviewed approximately five local airport master plans, one airport environmental assessment report and one local zoning case.

The Department also began to consider airport noise impacts in its review of all Federally assisted programs and projects (OMB Circular No. A-95-State Clearinghouse Reviews). This program represents an expanded coordination activity for the Arizona DOT.

The last airport land use compatibility project, completed in fiscal year 1979, involved the direct action by the Arizona DOT to adjust the process through the Department selected airport projects for State financial assistance. The Department incorporated SASP goals, including land use compatibility, into the priority programming process.

- Fiscal Year 1980 -

The Arizona DOT continued its airport land use compatibility program. In fact, the Department devoted a major effort to improving airport land use compatibility. The Department's surveillance activity increased significantly because of the large number of new airport master plans and master plan updates. The Arizona DOT committed more staff time to the completion of A-95 reviews and to the review of land development activities near several airports.

In 1980, the Department reviewed about eight local airport master plans and several airport environmental assessment reports for consistency with the Arizona SASP, including airport noise analysis. In addition, each Departmental review involved more staff time and more detailed analysis than that performed in the previous year. The Transportation Planning Division coordinated this review function with the Aeronautics Division. Final comments completed by the Aeronautics Division were submitted to each local airport sponsor. The Department also submitted comments and suggestions to the City of Phoenix regarding their alternative plans for Sky Harbor Airport (Arizona's largest air carrier airport).

The Arizona DOT also increased the level of its coordination and service activities. First, the Department completely revised its procedures for preparing OMB CRrcular No. A-95 Clearinghouse reviews. Consequently, the Arizona DOT reviewed all airport projects, as well as all development projects within 2 miles of any state system airport. This review included an analysis of both airport noise and obstructions. The exact number of A-95 reviews which the Department submitted formal comments for 8 projects. These comments were directed at projects which could be subject to high levels of airport noise. Secondly, the Department helped in the preparation of several major development plans. For example, the Arizona DOT actively participated in the Kino Redevelopment Area Plan. This area is located adjacent to the Tucson International Airport. The Transportation Planning Division analyzed potential noise impacts for a major community relocation project, as well as for the Maricopa Association of Governments Regional Airport System Plan. Finally, the Arizona DOT actively participated in the Tucson International Airport's Airport Noise Control Land Use Compatibility study (ANCLUC). The Transportation Planning Division committed staff time to send a representative to that study's policy steering committee.

During fiscal year 1980, the Arizona DOT utilized federal funds to support many of these airport land use compatibility projects. However, the Department currently uses State resources to continue the work program because the U.S. Congress has not authorized expenditures from the FAA's Airport Development Assistance Program. Consequently, the Arizona DOT has continued to fund its surveillance and coordinative activities. This includes airport master plan and environmental assessment report reviews, A-95 review coordination, and continued representation on the policy steering committee for the Tucson ANCLUC.

c. Current Activities

Significantly, the current lack of federal assistance has not prevented the Arizona DOT from continuing to undertake direct departmental activities as well as to fund additional local implementation activities.

First, the Arizona DOT has assisted the Arizona Department of Economic Planning and Development to prepare a comprehensive plan for the City of Showlow. This plan contains an airport element which includes an analysis of noise impacts.

The Department is currently providing funds for Cochise County to prepare a County Airport System Plan. This plan will include the preparation of airport noise contours and an analysis of noise impacts.

The Department is also providing funds for the Southeastern Arizona Governments Association to provide a regional airport land use compatibility study for the general aviation airports in 4 counties. The Arizona DOT is coordinating this study with the Cochise County airport system study.

The Aeronautics Division is funding a study to analyze the need for additional airport sites for general aviation activity in Arizona. It is the Department's policy to encourage new airports to locate in areas where adjacent lands will be compatible with present and future airport operations. Consequently, the Transportation Planning Division will assist the airport site selection committee in assessing future noise impact areas, and help the committee to prepare land use compatibility guidelines.

Finally, the Arizona DOT is funding a project which is intended to assist airport operators in ensuring compatible land uses on State lands surrounding airport sites. The Arizona DOT will develop and attempt to implement, with the Arizona State

Land Department, land use guidelines to promote airport-land use compatibility.

D. Future Projects

The Arizona DOT plans to evaluate additional implementation projects when either federal or state funds become available. The Department recognizes that other State actions will also help to achieve airport land use compatibility. The Arizona DOT is considering the following projects:

1. Amending the Arizona Revised Statutes to define significant levels of noise as an airport hazard (Ldn 65+) so that political subdivisions can prepare airport zoning ordinances for noise as well as obstructions.
2. Amending the Urban Environment Management Act (municipal planning enabling legislation) to include airport noise as an explicit purpose for municipalities preparing comprehensive plans and adopting zoning ordinances.

In addition, the general plan for cities over 50,000 population with a primary system airport should include a land use compatibility element as part of the transportation elements.

3. Determine whether counties wish to strengthen their planning enabling legislation to achieve same powers that would be provided to cities by the above mentioned amendments. If response is affirmative, then ADOT will assist in developing such legislation.

4. Develop and attempt to implement, with the Bureau of Land Management and the United States Forest Service, land use guidelines to promote airport land use compatibility.

5. Provide technical assistance to local governments to promote airport, land use compatibility.

IV. CONCLUSION

This paper has examined the Arizona DOT's airport land use compatibility work program. In preparing the second Arizona State Airport System Plan, the Arizona DOT recognized that airport noise and land use compatibility conflicts could be the most significant environmental issue confronting Arizona's state airport system. Currently, negative airport noise impacts are concentrated primarily in the State's metropolitan areas; however, the expected growth in both population and aviation activity is likely to create more problems unless positive actions are taken to prevent or lessen adverse noise impacts.

The Arizona DOT responded to this situation first by identifying a simple goal; trying to achieve compatibility between Arizona's airports and adjacent land uses. The Department also supported this goal with objectives and policies which were action oriented. In other words, the Arizona State Airport System Plan viewed state aviation planning as a means to deal with the problems, needs and opportunities of the statewide airport system. The most important part of that planning process is the Department's commitment to direct implementation activities. By integrating noise and land use concerns into the aviation planning process, and coordinating these efforts with local governments, interest groups, and the public, the Arizona DOT has established the basis for better decision making.

Finally, the Department's land use compatibility work program represents, in the Department's judgement, the judicious use of federal aviation planning funds. The Arizona DOT, in preparing its updated SASP, used federal funds to establish its expertise in the field of airport noise. Federal funds allowed Arizona DOT to prepare its own system plan and to fund what could be considered the "start-up" costs for its land use compatibility program. Subsequently, federal funds also enabled the Department to begin implementation of that program. The Arizona DOT used federal funds to prepare its public information brochure. The tremendous response which the Department received because of this brochure helped to convince numerous officials of the need for a continued state commitment to airport land use compatibility planning. Subsequently, the Arizona DOT began to support this program with state aviation planning funds. In effect, federal airport development assistance program funds, when used as "seed money" for state airport noise abatement planning, enabled the Arizona DOT to begin to make a well-planned comprehensive response to the State's airport noise problems.

WHEN DOES PROTECTIVE ZONING BECOME A "TAKING"?

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WINER, NEUBURGER AND SIVE

WHEN DOES PROTECTIVE ZONING BECOME A "TAKING"?

It is peculiar characteristic of lawyers that they have the perhaps dubious ability to see the same issues through different lenses and thus, differently in virtually the same glimpse. Issues that seem terribly clear one minue, can be frustratingly opaque the next. Indeed, to some, lawyers may seem rather cavalierly to ignore important internal contradictions.

In the most recent "taking" case, for example, Justice Brennan wrote just last March that "the determination of a 'taking' is 'a question of degree -- and therefore, cannot be disposed of by general propositions.'" It calls instead, he wrote, "'as much for the exercise of judgment as for the application of logic,' and has been called 'the most haunting jurisprudential problem in the field of contemporary land use law... the lawyer's equivalent of the physicist's hunt for the quark.'" San Diego Gas and Electric Company v. City of San Diego, 101 S. Ct. 1287, 1302 (1981) (Brennan dissenting). Yet only 6 pages later in his dissenting opinion, Justice Brennan suggests that this area of the law is not only capable of being known and understood by not only judges and lawyers, but also is capable of being mastered and used by municipal officials. "After all", he writes, "a policeman must know the Constitution, then why not a planner?" Id. at 1308.

With that encouragement about the simplicity of "taking" concepts or the sanguine confidence in the abilities of lawyers, planners and others to understand and make sense of a constantly changing kaleidoscope of frequently inconsistent decisions, let us make the attempt to try to master the legal "quarks" of airport zoning and taking concepts.

I. INTRODUCTION AND BACKGROUND

But first some quick background. Zoning is the process by which states and their political subdivisions (such as cities, counties, and special governmental entities) regulate the uses of land within their jurisdiction. Zoning also includes the regulation of specific features of such uses, such as how tall buildings may be constructed or how far back from lot lines they must be positioned. "Airport zoning" or "protective zoning for airports" refers to a sub-category of zoning regulations which have four basic purposes: first, restricting heights of buildings, trees and other structures in the vicinity of airports and runways to assure adequate visibility and obstruction-free landing and take-off areas, second, restricting non-structural uses which would cause atmospheric impurities, like dust and smoke that might interfere with visibility, and restricting uses which would cause electronic interference with aircraft communications. These first two types of restrictions have been called "vertical zoning" in recognition of their focus upon hazards that exist above the ground. The third and fourth types of airport zoning regulations have been called "horizontal zoning"; they restrict the uses of land in the vicinity of airports -- generally to commercial or industrial uses to minimize the potential loss of life in the event of an aircraft crash -- the fourth type.

Zoning concepts have been prevalent in this country since the beginning of this century and reasonable non-arbitrary zoning regulations have been widely upheld as valid exercises of the police powers of states and municipalities going back to the leading case of *Village of Euclid* v. *Ambler Realty Company*, 272 U.S. 365, 47 S.Ct. 114 (1926), decided by the Supreme Court in 1926. Under our federal system, the states became heirs as it were, to the legislative powers of the British Parliament, the three principal powers of the sovereign: eminent domain, taxation and the broad powers of police. The police power includes the power to legislate and enforce regulations over such matters as public safety, health, morality, peace and quiet and law and order. *Berman* v. *Parker*, 348 U.S. 26, 32 (1954).

Our Constitution, which places limits on the exercise of these powers includes in the Fifth Amendment the provision that "private property [shall not] be taken for public use, without just compensation." This prohibition has been made applicable to the states by the Fourteenth Amendment, although many states have similar provisions in their own state constitutions. The classic example, of course, of the exercise of the eminent domain power is the taking of land for a highway or a public park or building. When a state or municipality acquires property under this power in the usual way, by formally acquiring title to the fee interest to it, there is no question that just compensation is due. And the amount of such compensation is fixed either by agreement or by a judicial condemnation proceeding brought for this purpose by the acquiring governmental body. It has long been recognized, however, that the government may acquire the right to public use of the property, even without taking title to it, through the exercise of its police powers, (such as by regulation which imposes such severe restrictions on private ownership that the property loses all value for its original owner) or through the exercise of its proprietary or "enterprise" functions (such as by owning and operating a municipal water company or an airport). When such "takings" occur, there is held to arise a cause of action for "inverse condemnation", that is, a claim brought by a landowner against the governmental entity for "just compensation" within the context of a typical judicial proceeding.

II. THEORIES AND TESTS USED IN TAKING CASES GENERALLY

Before procedding to discuss "taking" cases in the airport zoning area, it will be helpful to discuss the theories and tests which have traditionally been used by courts in general "taking" cases.

The standard approach in such cases is that there is no consistent test and "no set formula" to determine where regulation ends and taking begins. Goldblatt v. Town of Hempstead, 396 U.S. 590, 594 (1962). Whether a regulatory enactment will be held to constitute a taking depends on the facts and circumstances of the given situation and calls for a careful weighing of whether the enactment "goes too far" or is "so onerous" as to require, in fairness, compensation.

However, commentators have identified four approaches or general theories which have been developed and applied over the years to determine when a taking has occurred. The first and probably most obvious theory is termed the "physical invasion" approach. It holds that where public agents assume actual legal control over private property -- for example, by compelling transfer of title from the former owner to the government -- a classic case of a taking has occurred. This theory has also been expanded to cover such cases as where a complaining party's property has been flooded pursuant to a state law providing for the construction of flood control dams. Pumpelly v. Green Bay Company, 80 U.S. (13 Wall.) 166 (1871). As the Court explained in that case, it would be a "very curious and unsatisfactory" result if the government could totally destroy a property's value by causing it to be occupied for the public's benefit without making any compensation. Id. at 177.

However, this theory is not adequate to account for the majority of taking cases, which deal with governmental regulation, where there is no "physical invasion" of the property.

Thus, a second theory has been developed to assess regulatory "takings", termed the "nuisance abatement" theory. This approach would suggest that where private property is used in a manner that harms the general public, compensation is not required when the public reacts to protect itself from the nuisance-like use. This theory has been widely used by courts to sustain a great variety of regulations, such as for example, the uncompensated destriction of diseased trees, animals and crops, and the upholding of fire regulations, food and drug laws, and occupational safety standards. See Philip Soper, "The Constitutional Framework of Environmental Law," Federal Environmental Law 54 (1974).

However, this theory has become increasingly unsatisfactory in modern times because it seems to suggest that the private property owner is somehow "at fault" for allowing the nuisance and thus should be "punished" by the virtual confiscation of his property. To the contrary, much of today's regulation concerns activities that cannot be considered per se nuisances, since "a nuisance may be merely a right thing in the wrong place." Village of Euclid v. Ambler Realty Company, 272 U.S. 365, 388 (1926).

An example of this theory in operation involved a city ordinance prohibiting the use of a brick kiln in a residential neighborhood. Because of the ordinance, the complainant's brick manufacturing operation was drastically reduced in value, yet no compensation was held to be due because the smoke and fumes from the operation fit into classic nuisance categories, even though the residential use grew up after the manufacturing operation was in place. Hadacheck v. Sebastian, 239 U.S. 394 (1915).

To cope with the seeming unfairness of penalizing an unfortunate owner of property who later becomes subject to severe regulation, courts have devised two further approaches, the "balancing" theory and the "diminuition in value" theory. Under the balancing theory a court is called upon to balance the extent of the government's intrusion as measured by the economic or physical loss to the property owners and the extent of the public benefit to be derived from the government action. But this test, while it allows for a certain flexibility, ultimately comes down to offering no standards at all as to how the balance should be struck. Furthermore, it does not seem fair to assess whether compensation should be due to an individual property owner because of a legislative enactment on the basis of the extent of public benefit to be derived from it. Presumably the greater the public benefit the more willing should be the public to pay for its benefits and the more likely should be the conclusion that a taking has occurred. Yet the balancing test as applied would seem to call for the opposite result; the more beneficial the enactment the less likely will the government be "penalized" by having to make compensation.

Because of the needs for flexibility and yet for some objective criteria, the most frequently followed approach of courts in these cases has been the "diminuition of value" theory, which focuses, first, on whether the regulation serves a valid public purpose or advances a legitimate governmental interest and, second, on whether, and the extent to which, the regulation may have destroyed the value of the complainant's property. The most often cited case using this approach is

Pennsylvania Coal Company v. Mahon, 260 U.S. 393 (1922). There, the Court invalidated a state statute forbidding the mining of coal in such a way as to cause subsidence of houses and other structures. Previously, the mining company had been able to mine in the prohibited manner; moreover, the endangered home-owners had purchased only surface rights and their deed had specifically reserved to the coal company all rights to remove the underground coal. The Court focused on the fact that the state legislation would have made the coal company's property and contract rights to extract coal virtually totally worthless. In an often quoted passage, Justice Holmes declared for the Court that while "Government hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general law, when [the diminuition in value] reaches a certain magnitude, in most if not in all cases there must be an exercise of eminent domain and compensation". Id. at 413.

Under this test courts have found no taking, even though the diminuition in value was quite drastic. In the leading zoning case decided by the Supreme Court, for example, Village of Euclid v. Ambler Realty Company, 272 U.S. 365 (1926), which was four years after Pennsylvania Coal, the Court upheld a comprehensive zoning ordinance prohibiting industrial uses of a tract of land which the plaintiffs had purchased and had specifically planned to use for industrial development, even though the consequent reduction in the land's value was 75%. Id. at 384. And in another example, Goldblatt v. Town of Hampstead, 369 U.S. 590 (1962) the Court in 1962 held that a town ordinance regulating dredging and pit excavating below the water table was valid and that no compensation was due to sand and gravel mine operators who contended that the ordinance in effect would prevent them from continuing their business. The Court declared that the ordinance merely prevented the property from being used for purposes which would be injurious to the health and safety of the community but would not prevent the owners from using their property for lawful purposes for which it had suffered no diminuition in value.

III. TAKINGS IN AVIATION CASES

There is another line of cases, however, in whic taking concepts have been applied, not to the regulation of property by the government but to the operation of a governmental enterprise which results in diminuition -- sometimes severe -- of property values. These are the 1946 decision of the Supreme Court in United States v. Causby, 328 U.S. 256 (1946) and the Court's decision 16 years later in Griggs v. County of Allegheny, Pennsylvania, 369 U.S. 85, 82 S.Ct. 531 (1962).

In Causby, the Court held that flights of heavy military aircraft -- bombers -- owned and operated by the United States over private lands, which flew so low (down to 83 feet in elevation) and so frequently and which were so noisy that private landowners lost sleep, became nervous and frightened, and could not run their chicken farm because the chickens would "fly into the walls from fright" resulted in a taking of an "air easement" in the superadjacent airspace over the property. The amount of the taking was set as the amount of the property's value lost to the landowner by reason of the federal government's appropriation to itself of the right to use the airspace for its planes.

The Court distinguished this case from those situations where flights were made within the navigable airspace which Congress had placed within the public domain. Here, the Court said, "if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere. Otherwise buildings could not be erected, trees could not be planted and even fences could not be run." Id. at 264. The Court then went on to say that the "landowner owns at least as much of the space above the ground as he can occupy or use in connection with the land." *Id.* As I will discuss later, this kind analysis had led to some anomalous results in airport zoning cases.

In *Griggs* the Court held that where noise from aircraft taking off from and landing at a county-owned airport made a home located near the end of one of the runways, "undesirable and unbearable" for residential use, there was a "taking" of an air easement for which the airport owner would be required to pay just compensation. The Court anologized the situation under review to that where the county might be constructing a bridge for which it would need to purchase property or easements for the approaches to the bridge. Since the airport was operated for public benefit and since the proper and safe operation of the airport required that rights of way be obtained for flight paths close to the ground for take-offs and landings, the Court declared, the government had to in effect "purchase" the needed rights of way.

IV. AIRPORT ZONING CASES

No airport zoning cases squarely presenting these crucial taking issues have yet reached the Supreme Court.* Thus, the cases in this area are all from various state courts, which increases the likelihood of reaching divergent results. And there have been divergent and sometimes anomalous results. For the next few minutes, I am going to briefly discuss each of the four types of airport protective zoning restrictions I mentioned earlier to see how they have fared under the takings theories applied to them.

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*In *Indiana Toll Road Commission* v. *Jankovich*, certiorari was granted but later denied as having been improvidently granted. 379 U.S. 487 (1965).

A. Height Restrictions

The first and probably most pervasive type of zoning regulation is a limitation of the height of structures and vegetation designed to assure clear and unobstructed approaches to runways. Typically, such restrictions prohibit obstructions extending above a graduated plane below and paralleling the glide slope for each runway. Thus, the heights of structures may be severely limited near the end of runways and less restricted as the horizontal distance from the airport increases.

Almost uniformly courts have held such restrictions to constitute a "taking" under the authority of Causby and Griggs. Even though courts declare that the restrictions are imposed as zoning regulations under the police power, their effect is not to restrict certain uses of land for the benefit of all landowners by collecting, organizing and harmonizing uses -- as zoning traditionally does -- but rather courts hold that airport zoning height restrictions limit the uses of property for the sole benefit of the airport. This analysis thus holds that the conversion of such airspaces for the exclusive use of the airport and its aircraft in effect "takes" a property right for which the landowner should be paid just compensation. Courts reason that a privately-owned airport could not be validly so benefitted through governmental action, then why should geovernmentally owned airports be able to lessen private property values to their own benefit?

An illustrative case in Indiana Toll Road Commission v. Jankovich, 244 Ind. 574, 193 N.E.2nd 237 (1963), cert. dismissed, 379 U.S. 487 (1965), which involved a height restriction zoning restriction applicable to lands surrounding the Gary Municipal Airport. Suit was brought against the toll road commission for constructing a road which projected 6½ feet into the prohibited area to an elevation of 25 feet. The Indiana Supreme Court held that the city zoning ordinance was invalid as a taking of "ordinarily usable air space", without the payment of compensation. 193 N.E.2nd at 241. Another illustration is provided in the case of Sneed v. Riverside County, 218 Cal, App.2d 205, 32 Cal. Rptr. 318 (1963), where a height restriction was applied to a farm used for the breeding of horses. Various structures on the farm exceeded the heights permitted by the ordinance, which ranged from a low of 4 feet nearest the airport to 75 feet at the most distant location. The plaintiff contended successfully that the ordinance took an air easement over 60 acres of his property, reducing its value from $550,000 to $225,000.

While the more recent case of Village of Willoughby Hills v. Corrigan, 29 Ohio St.2d 39, 278 N.E.2d 658 (1972) appears at first glance to come down the other way, the cases are logically consistent. In Willoughby Hills, the Ohio Supreme Court held that owners of property in the Airport Hazard area, which was subject to a height limitation of 70 feet, did not suffer a taking since the normal zoning ordinance otherwise applicable to the property would have limited structure heights to 35 feet in any case. Thus, the court held there was no "damage" for which just compensation would be due and, in any event, the plaintiffs had no air rights above 35 feet to be taken.

More recently the Supreme Court of Minnesota found a "taking" where it was shown that severe use and height restrictions operated to the exclusive benefit of the airport and dramatically lowered the complaining party's land. McShane v. City of Faribault, 292 N.W.2d 253 (1980).

Among the cases that go the other way are two Florida cases: Harrell's Candy Kitchen, Inc. v. Sarasota-Manatee Airport Authority, 111 So.2d 439 (Fla. Sup.Ct., 1959) and Waring v. Peterson, 137 So.2d 268 (Fla. Dist. Ct., App. 1962). Harrell's Candy Kitchen involved a suit brought by an airport owner to enjoin the construction of an ornamental roof to be used for advertising purposes as a superstructure on top of an already existing building located near the airport. The superstructure would have projected into the prohibited area by 13 feet. The court held that while the superstructure would have been "beneficial" to the use of building, it was not "essential" to it. The Court employed a sort of balancing test analysis in finding the ordinance valid.

In Waring, the Court upheld a general airport zoning ordinance which included a 30 foot height restriction in aircraft approach zones. The court based its holding on Harrell's Candy Kitchen and the point that the attack on the zoning ordinance was general and not directed to specific provisions as applied to specific parcels of property.

With respect to the second type of zoning regulations -- vertical restrictions to eliminate non-structural hazards to aircraft safety -- there is very little doubt that no substantial impediments stand in the way of such restrictions. Assuming the restrictions are directed to a legitimate govermental interest, in this case safety of air travelers and residents, and assuming that the regulation meploys valid means of furthering that interest; restrictions on uses which would cause smoke, dust, electronic emissions or other hazards to aircraft, such regulations would be well within the ambit of the police power as defined by Village of Euclid v. Ambler Realty Company and its progeny and as delineated by the taking cases using the nuisance abatement approach.

The only limitation in this area would seem to be the traditional one stemming from Pennsylvania Coal, that the diminuition of value of the regulated property owner not be so great as to virtually destroy all reasonable use of the land.

With regard to horizontal zoning restrictions, such as the third type of zoning regulations, which call for regulating uses of land so as to promote compatible uses near airports and forestall inverse condemnation suits, the cases have reached mixed results. Two California decisions have held that the re-zoning of land in areas affected by an airport, either to *prevent* or to *reduce* residential development, are valid exercises of the police power and do not constitute takings. *Smith* v. *County of Santa Barbara*, 243 Cal. App.2d 126, 52 Cal. Rptr. 292 (1966); *Morse* v. *County of San Luis Obispo*, 247 Cal. App.2d 600, 55 Cal. Rptr. 710 (1967). On the other hand, zoning ordinances are subject to other constitutional requirements, such as the due process and equal protection guarantees, which are to assure that legislative enactments do not treat specific situations in an arbitrary or unreasonable manner. The cases which have held use restrictions for noise compatibility invalid are cases in which these other constitutional standards were also involed, thus making strict analysis under "taking" concepts above impossible. For example, a Kentucky case held that a zoning ordinance which permitted apartment houses and hospitals, but not motels, in an airport-affected area was arbitrary and unreasonable on that basis. *Banks* v. *Fayette County Board of Airport Zoning Appeals*, 313 S.W.2d 416 (Ky. App. 1958). Or where zoning ordinances were designed to bar certain kinds of development, or any development, near airports so that the governmental entity could later condemn or acquire the property more cheaply for airport uses, such zoning regulations have been struck down. *Kissinger* v. *Los Angeles*, 161 Cal. App.2d, 454, 327 P.2d 10 (1958); *Peacock* v. *County of Sacramento*, 271 Cal. App. 2d 845, 77 Cal. Rptr. 391 (1969). I would argue that the result would be the same under any test or involving any kind of restriction. If the government acts to achieve an improper purpose, the enactment can be declared invalid.

While the rationale for such restrictions -- to make near-airport uses more compatible and thus, to lessen the potential for noise related damage suits -- suggests that an enterprise theory may someday emerge as a limitation in this area (since the restrictions would seem to have as their main purpose directly benefitting the airport rather than the public generally), I do not believe this is likely. For one reason, use restrictions lie at the heart of zoning and closely fulfill the role traditionally played by zoning to harmonize divergent and sometimes conflicting uses by grouping compatible uses together. For a second reason, since use restrictions fill a clearly valid role, the fact that such restrictions secondarily confer a benefit on the airport, which may or may not be owned and operated by the zoning authority, is only incidental to this valid underlying purpose, and should not furnish the means to invalidate the primary purpose.

A similar series of generally validating results have occurred in the fourth category of airport zoning regulations, involving use restrictions for safety purposes; these typically are restrictions to prevent congestions or aggregations of people in areas exposed to hazards for aircraft crashes. As with noise compatibility zoning such regulation came well within the ambit of the police power, as long as they are reasonable and not arbitrary.

V. CONCLUSION

In conclusion, it would be nice to say that the distinctions developed earlier are being carefully observed by the courts. But this is not so. The law is a dynamic body of concepts and this area of the law is particularly subject to change in the years ahead.

The first reason for this is financial. It is a truism these days that governmental entities are having great difficulty fulfilling their normal responsibilities, without incurring the added financial burden of paying "just compensation" for all sorts of regulatory enactments that courts may later hold have "gone too far." Secondly, and closely related is the fact that with inflation in property values, the cost of "just compensation" may be staggering and far beyond the ordinary ability of relatively modest governmental units like cities and counties to handle. The recent case of Agins v. City of Tiburon, 447 U.S. 255, 100 S.Ct. 2138 (1980), involving an inverse condemnation claim with respect to 5 acres of ridgelands with "magnificient views of San Francisco Bay and the scenic surrounding areas [and having] the highest market values of all lands" in Tiburon, furnishes a good example of this problem, as does the more recent case of San Diego Gas & Electric Company v. City of San Diego, 101 S.Ct. 1287 (1981), where an inverse condemnation award for $3 million involving 214 acres had been granted in the court below. Indeed, in both cases the municipalities, after zoning these lands for open space uses, had begun and then terminated eminent domain procedures which would have led to the outright acquisition of the lands in question.

The other reasons why change in the area is to be expected are that there appears to be a perception taking hold in recent Agins and San Diego Gas & Electric cases that governments have gone too far and perhaps are being too cavalier about enacting land use regulations, especially when they impose burdens on property owners in their actual use of property or their expectation of profit from property, that seem unfair.

One suggested solution to these problems is that there might be a middle ground between police power regulations on one hand (where no compensation is paid) and "takings" on the other hand (where the governmental authority can be faced with a potentially overwhelming award against it). Justice Brennan argued in his dissenting opinion in San Diego Gas & Electric that if a regulatory enactment goes too far and thereby becomes a "taking", the governmental body ought to have the opportunity of rescinding the enactment, but should pay compensation to injured property owners for the loss of full use of their property during the interim.

In addition to the uncertainties surrounding taking concepts for the future, it seems likely that protective zoning will not play a very large role in protecting airports from noise complaints in the future for the principal reason that comprehensive zoning schemes cannot overnight "re-plan" and "re-develop" areas once they have become developed. Nonconforming uses cannot be immediately terminated merely by imposing zoning use restrictions. Since many, if not most, airports are in areas with some significant degree of development already in place, airport zoning will be at best a partial remedy. However, for new airports comprehensive airport zoning would have substantial benefits. Even for older airports, zoning used in combination with air easements and noise exposure maps called for under the Aviation Safety and Noise Abatement Act of 1979 will have an important role to play in improving the circumstances of compatible co-existence between our nation's airports and the citizens who fly and otherwise benefit from them.

ARE THERE ALTERNATIVES TO ZONING FOR AIRPORT PROTECTION?

ROBERT DOYLE
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ARE THERE ALTERNATIVES TO ZONING FOR AIRPORT PROTECTION?

BACKGROUND

Purpose and Scope of Presentation

- Review of ways and means to protect airports from adverse impacts that may result from incompatible land use development within the airport environs.
- Focus on nonzoning methods used by local and state governments relative to general aviation airport facilities.

Key Definitions

- General Aviation (GA) includes all civil aviation activity except that of certificated route air carriers and air commuter operations.
- Airport Environs is that geographic area most directly influenced by the presence and operation of a particular airport.

General Aviation Activity Trends

- Growing in numbers, intensity, and sophistication.
- Moderated somewhat by current air traffic control restrictions and escalating aviation fuel costs.
- New interest and emphasis on aircraft noise annoyance problems in addition to overall noise exposure.

Forms of General Aviation Activity

- Type of aircraft
  - corporate jets • business/pleasure • training • special
- GA airport facilities:
  - by type (all GA; high GA, low AC; low GA, high AC; other)
  - by location (urban; suburban; rural; remote)
  - by status (existing-stable; existing-expansion; new)

Compatible Use Planning Process

- Undertake process on premise that litigation may ensue in future.
- Six basic steps in process:
  - Determine nature and extent of present situation
  - Determine nature and extent of projected conditions
  - Determine on-airport measures that can be taken to improve noise impacts
  - Define residual problem--present and future
  - Determine off-airport land use measures that can be taken to deal with residual problem
  - Develop and agree upon coordinated plan of improvement, including implementation program

Forms of Airport-Oriented Zoning

- Standard height control restrictions re FAA's Part 77
- Combination height and noise overlay zones (Fresno)
- Special airport planned unit development (Kansas City)
- State imposed airport impact zoning provisions (Maryland, California, Hawaii, Florida)

Types of Non-Zoning Alternatives

- Property acquisition:
  - fee simple
  - development rights
  - avigation easements
  - purchase assurance
- Development controls:
  - community plan requirements
  - subdivision regulations
  - building codes
  - capital improvements programs
  - urban growth management procedures
- Other techniques
  - fair disclosure property transfer requirements
  - tax incentives
  - noise monitoring systems
  - noise abatement staffs
  - noise abatement committees

PROPERTY ACQUISITION

Outright Acquisition in Fee Simple

- Typically used in areas permanently subjected to aircraft noise exposure of 75 LDN or greater
- Attitude surveys useful in determining possible exceptions to this "rule" (along with public involvement)
- Examples: Sea-Tac; Lambert-St. Louis; Los Angeles
- Landbanking application also possible (Atlanta)

Acquisition of Development Rights

- All rights to property uses that are or would be incompatible with aircraft operations obtained by airport sponsor
- If rights to be acquired represent more than about 60% of estimated property value, then fee simple approach should be used
- Property remains on local tax rolls and may be utilized for airport-compatible uses
- Miramar Naval Air Station in California best example to date--grew out of initial AICUZ program
- Suffolk County, New York, protecting agricultural lands in same way

Avigation Easements

- Purchased by airport sponsor via negotiation or condemnation (sometimes in response to court order)
- Mandatory dedication to sponsor at time of subdivision approval
- Acquired in return for appropriate sound attenuation
- Acquired as a result of litigation (actual or threatened)
- Fulfills compliance with California noise standards
- Examples: Sea-Tac; Fresno; Tampa

Purchase Assurance

- Typically used in areas where noise exposure is currently greater than 75 LDN but expected to be in 70-75 LDN at some point in the future
- Also used where decision has been made to retain rather than clear residential neighborhood (for tax purposes, community stability, school attendance support, etc.)
- Airport sponsor acquires property at fair market value, sound insulates to extent possible, and resells with avigation easement
- Net cost to sponsor (if any) approximates cost of avigation easement
- Revolving fund approach
- Represents useful way to eliminate vocal opponents of airport in many instances
- Examples: Sea-Tac (originator of idea); St. Louis

DEVELOPMENT CONTROLS

Community Plan Requirements

- A number of states legislatively require local jurisdictions to prepare and adopt general community plans in the form of an official ordinance. Land use elements of such comprehensive plans can and should reflect airport compatibility provisions
- Noise elements (if required) of these general plan ordinances can likewise reflect airport-oriented recommendations
- Specific plan requirements for airports and their environs are mandated by some states, such as California and Florida
- Whether in ordinance or advisory form, an accepted general or specific plan provides an indication of community intent relative to airport compatible land use. As such, it may have a bearing on the outcome of future litigation efforts.

Subdivision Regulations

- Land development controls and improvement requirements of importance to airport compatibility are often included in subdivision review and approval regulations
- Noise insulation requirements for new residential development and fair disclosure of anticipated noise exposure levels have been incorporated in such regulations (Fairfax County, Virginia)
- Dedication of avigation easements prior to property sale and development may also be required (Fresno, California)

Building and Housing Codes

- Sound attenuation requirements designed to comply with prescribed noise level standards may be included in building codes governing new construction
- Similarly, interior noise level requirements may be built into housing occupancy codes
- Communities in California, for example, must comply with general as well as aircraft noise standards

Capital Improvement Programs

- Many states require local jurisdictions to prepare and adopt capital improvement programs. These programs often include noise-sensitive public facilities such as schools, hospitals, and places of general assembly

- Both the location and timing of such noise-sensitive capital improvements can be governed by this type of program

- Georgia planning enabling legislation good example.

Utility Extension Programs

- The location and timing of key utility extensions--particularly water and sewer facilities--may be set forth as part of an official program of action (Section 208 Wastewater Facilities Plan is one example). Such a program can and should reflect airport protection concerns vis-a-vis the encouragement of incompatible land use patterns (cite Sacramento example)

- Utility extension provisions may also be developed and adopted in ordinance form (Gainesville, Georgia)

Urban Growth Management Techniques

- Residential and other forms of development may be directed as to timing, location, and intensity by means of growth management techniques such as the Ramapo, New York, "point accumulation" process and the Petaluma, California, annual housing unit limitation approach (both of which have been sustained in court tests)

- Lexington, Kentucky, is good example relative to airport protection. Bluegrass Field still surrounded by agricultural uses due to application of urban services boundary provisions

OTHER TECHNIQUES

Fair Disclosure (Truth-in-Sales) Requirements

- May be included as part of subdivision approval process, in the form of a specific local ordinance, or as part of statewide general legislation
- Real estate interests often oppose such an approach
- Representative examples include Fairfax County, Virginia; St. Mary's County, Maryland; State of California; and the City of Pacific Grove, California

Tax Incentives

- Preservation of lands currently used for agricultural purposes (and thus compatible with aircraft operations) may be accomplished in some states via tax concessions to the property owner
- Sacramento County application of California Land Conservation Act of 1965 (Williamson Act) to aid in protecting Sacramento Metro Airport from urban encroachment is prime example

A-95 Review Process

- Regional planning agencies are required to review federally funded development projects via the Office of Management and Budgets' (OMB) A-95 process
- If not in accordance with regional/federal plans or guidelines, a project that involves noise-sensitive uses could receive a negative review and thus probably would not be approved by the federal funding agency
- Tampa residential development in high noise exposure zone turned down by HUD is good example

Noise Monitoring Systems

- Installation of noise monitoring system by airport sponsor useful as a management tool in determining noise impacts and effects of noise abatement procedures
- Many examples, including San Francisco, Honolulu, San Jose, etc.

Noise Abatement Staffs

- Addition of noise abatement officers and/or other specialists to the airport staff can be useful in dealing with aircraft noise impacts
- Educational process involved (both ways) which may result in greater land use compatibility
- Airport staff more apt to be aware of potential land use conflicts in advance of problem; airport neighbors, pilots, and others better informed about operating procedures and needs of the facility
- Torrance, California, good general aviation airport example

Noise Abatement Committees

- Special committees comprised of technical, political, and citizen interests can be helpful in the study and resolution of both existing and potential aircraft noise impact problems
- Minneapolis-St. Paul and Boston Logan Airport groups are representative examples

CONCLUSIONS AND RECOMMENDATIONS

1. FACTUAL UNDERSTANDING OF SITUATION
   - What is real problem?
   - Who should be involved in planning process?
   - Proper organization of process takes time

2. FREE, HONEST, AND OBJECTIVE APPROACH
   - Compromise an absolute requirement in most cases
   - Public relations techniques may be useful in short run but will not solve basic problems
   - Two-way education usually breeds more reasonable positions by all parties of interest

3. CUSTOMIZED SOLUTION
   - No two situations identical, therefore each plan/program/"solution" needs to be customized--for both large and small airports
   - Laws and customs of state and locale must be understood
   - Process of setting up a "dialogue of reason" may take a lot of time, but is worth the effort
   - What works some place else may or may not be applicable

4. FOCUS ON IMPLEMENTATION
   - Noise plan/program implementation responsibilities must be worked out and agreed upon
   - Details must be completed even if everyone wants to get the project over as soon as possible

- Fund sources and uses, staging of actions, and legislative needs (state and local) must be clearly settled

- Periodic review and updating of program also must be built into implementation process

5. ASSUME LITIGATION MAY ENSUE IN FUTURE

   - Logic and comprehensive approach in development of plan and program should be clear if litigation occurs

   - Thought process should begin with the assumption of a future need for a defensible position in the event of litigation and work backward to present

   - Typically required where controversy exists now or may in future (most GA airport situations would not be applicable)

6. GA AIRPORT LAND USE CONTROL SUGGESTIONS

   - Acquire land in fee simple prior to development

   - Acquire avigation easements at time of subdivision approval, plus truth-in-sales provisions

   - Make sure airport always considered as part of comprehensive planning process

A CASE STUDY OF RICHARD LLOYD JONES, JR. AIRPORT

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CITY OF TULSA

A CASE STUDY OF RICHARD LLOYD JONES, JR. AIRPORT

This is a case study of Richard Lloyd Jones, Jr. Airport (formerly Riverside Airport) in Tulsa, Oklahoma, reviewing the airport noise control and land use compatibility (ANCLUC) program. In order to fully understand this ANCLUC study, I believe a little history is appropriate at this time and possibly a familiarization of the airport.

In 1972, a team was put together of a Breisch Engineering Engineer, a Murray Jones Murray Architect, and R. Dixon Speas economic consultants. Along with airport staff and very little outside help to accomplish a master plan study. This was based on a planning grant program for master plan development for a 20-year period. In order to understand the elements of the master plan, a brief inventory will show that we have 3 runways (Runway 18R/36L, which is 100 feet wide and 4,000 feet long; Runway 18L/36R, which is 100 feet wide and 3,000 feet long; and Runway 12/30, which is 50 feed wide and 2,800 feet long). This airport is located on 700 acres of land, has 6 major FBO hangars, 8 commercial "T"-hangars, and 50 private "T"-hangars. We have 10 major taxiways paved parking area for 100 aircraft on 3 major aprons, and we had 297 single- and light-twin-engine general aviation aircraft based on the airport. The airport was the 33rd busiest airport by operations in the United States; and in 1972, we had 228,000 operations with 154 instrument approaches. We forecast a demand of 474 aircraft in 1995, including 13 jets. The forecast for operations was 287,000 operations by 1980 and 322,000 operations by 1995. We conducted a brief system analysis to find the relationships between Tulsa International Airport, which is our primary air carrier airport, and RVS to find the effect of the 2 airports with regard to airspace, air traffic control (including instrument flights and visual flights), and the effect of any loss of private airports of which there are 15 in the Tulsa area. It should be noted here that at the beginning of the study there were only 2 instrument landing systems in existence in Northeast Oklahoma. Both of these existed on one runway at Tulsa International Airport. The indepth airport analysis revolved primarily around the wind rose, existing terrain, and property owned by the airport. Approach slope clearance and capacity requirements. We additionally looked at operational expansion alternatives which include runway expansion on all 3 runways, taxiway improvement, hangar development, terminal development, and apron development of some 3 to 4 acres. It was finally determined, based on facility requirements, that Runway 18R/36L should be 5,900 feet long and 150 feet wide with an ILS approach on the south end; Runway 18L/36R should be 4,000 feet long and 100 feet wide; and Runway 12/30 should be 3,200 feet long and 75 feet wide. There would be a terminal addition containing some 14,000 square feet, new apron containing approximately 4 acres would be developed, and maximum hangar development would be 284 hangars along with 215 additional auto parking spaces. There would be land acquisition to purchase 34 homes with 115 acres and home value of from $30,000 to $65,000 each, with homes containing approximately 112 people.

As you can see from this review, we were pretty well moving with airport development in the way we felt necessary;

and we felt there would be very little opposition. We were spending a lot of time on terminal area development, a little time on approach and departure surfaces, and we were looking at some zoning and land-use plans. However, our primary idea was the airport comes first; and the community will definitely go along with us. The reason we felt this was the case at the time was the fact we had had little opposition to our master plan development at Tulsa International: and the community was, in fact, totally supportive of airports as the airport system is a major employer in Tulsa. The land use plan would include aviation commercial and noncommercial areas, aviation industrial, airport industrial, and some open space. The airport environs were reviewed by aircraft sound description system contours to help provide information for the composite noise rating contours which were ultimately presented and their change with the additions which the airport envisioned. This would ultimately determine the best airport environ land use, the terminal area plan, and the airport access plan. From this, we could develop schedules for implementation, along with cost estimates, economic feasibility, and financing of the $21 million improvements which were envisioned.

This, of course, evolved into an environmental impact assessment (EIA) which stated that the currentimpact of the airport on the environment was "no effect on natural resources", social and community development was good, and obviously the airport was socially acceptable. This phased development could occur in 3 basic staging plans which had most development occurring between 1975 and 1980, some additional minor development between 1980 and 1995, with the ultimate development occuring on the airport between 1985 and 1995. We believed that the community interest would be very high in support of this development, as the airport supports the community of jenks. As the airport grows, it becomes more flexible in handling more and larger aircraft. The airport becomes safer with longer runways and instrument landing system. There is an improved public investment; and, in fact, we could purchase land before it is fully developed. As you can see here, the airport was surrounded by wide-open spaces. However, some development was starting to occur; and the houses were starting to move closer and closer to the airport. Therefore, we felt a time-press to move forward toward completion of our master plan and statements made in public hearing.

We had publicized this public hearing well in advance in line with Federal Aviation Administration (FAA) requirements. Airport staff and the consultants had really not spent much time with jenks, as we felt the airport was Tulsa's airport; and we could go on about doing the things we needed to do. Jenks would, obviously, support the airport development. When the public hearing occurred on April 1, 1976, we presented the plan in about 45 minutes to what we thought would be a few people. However, 380 people attended, mostly from jenks; and they all wanted to speak against the airport. They indicated that jenks was not informed of the planning process, jenks wanted the airport out and the land returned to the community, and the pilots wanted the airport as a grass strip, at the most. There was no economic benefit to the community, as most airport operators had bad debt and did not do much shopping anyway. There was a strong desire to stop airport growth because they did not want jets in the community. The community is most important to these people. The master plan was, in fact, a surprise attack on jenks; and not enough media coverage was involved. Petitions containing thousands and thousands of signatures were presented by the people in the almost-full auditorium. To say the lease, we were amazed, quite frustrated, and believed the people were not really understanding what was presented. However, U must recall that, in fact, we did not have any public briefing sessions prior to this meeting. A community education really did not occur. However, I personally felt that if the Jenks individuals were educated and better informed, they, in fact, would not have such opposition to airport development. Therefore, in June of 1976, I asked at a Jenks city council meeting that a citizens committee be established. The Jenks city council immediately appointed all the rebel-rousers at the public hearing and asked that they serve on the citizens committee to review the airport problems. Second, we established the users committee, which consisted of aviation-related people representing all areas of interest on the airport. In July of 1976, the city of Jenks annexed city of Tulsa land which was south of 91st Street to preventexpansion to the south and, in fact, into the Jenks community. At this time, I was working with the citizens of Jenks and trying to discuss all possibilities openly and in a public forum. In fact, any time we had a citizens meeting, which was once every 2 weeks, we made sure all media invited the total public to these meetings. User committee members were invited with the idea they would help balance the understanding of the meeting. However, the users did not want to attend these open forum meetings; and they wanted separate meetings at the airport. So, we basically received no support from the users. We looked at all possibilities for airport development in an open public forum. These included the possibility of selling the total airport to Jenks or other interested individuals and all the other possibilities between that and full development of the airport to air carrier qualities. We looked at the airport's role in aviation and the environmental impacts. As we talked about these, we found that aircraft noise can be perceived or real. Aircraft overflights were a real problem to Jenks. Drainage from the airport, as the airport is within the levy and has a large volume of land which drains in Jenks' direction and should be controlled. Vehicle traffic from the airport and around the airport is a distinct problem for community traffic flow, and the lights from the proposed ILS would be a nuisance to the residents. Additionally, property purchase would decrease the home values; and elimination of some homes would reduce the sound buffer from other homes.

As I previously indicated, all media was informed and invited to these meetings. In fact, members of the citizens committee who had previously grumbled about no media coverage several times asked that the media not be invited. Meeting size varied from approximately 12 people on slow nights to over 500 people on other nights and were a real exercise in group psychology. Everything occurred at these meetings from total disruption at some, where we had to have dismissal; and others were there was a real learning experience. By and large, these meetings evolved in different groups of people asking questions which were asked in previous meetings and receiving the same answers.

However, some learning did occur. As these progressed, the Jenks city council made a very positive statement about airport development as part of one of their council meetings in April, 1977. They stated that, "as duly elected governing body of the city of Jenks, we respectfully submit the following as our formal policy statement. The city of Jenks recognizes the city of Tulsa to dictate growth in their corporate city limits and respectfully requests a similar confirmation inasmuch as Jenks is concerned. The city of Jenks vigorously opposes any expansion into the corporate limits of the city of Jenks as dictated by petition submitted to the city council. We also request that no expansion adversely affect the environment of the city of Jenks." Even though it was an unanticipated statement, it was somewhat positive in the respect that it said listen to our people and hear what their needs are; then think about redeveloping the airport master plan; and we will work with you. The users committee, during this time, was not interested and wanted selfish interests accomplished. Therefore, the airport staff was left with the responsibility of finding the true concerns of the public, which we found were based on the fact that RVS originally was established without consent of Jenks: and there were bad feelings even though the airport was begun in 1953. This was a perceived bad deal with Jenks residents in the land purchase, and real estate selfish interests to develop the airport land into homes were becoming quite prevalent now and apparently were prevalent then. The noise problems were really in relation to overflights and the fact that the citizens wanted to participate in noise measurement. They wanted nighttime operations controlled, and they did not want any jets. Some housing in the area was a noise buffer, and no property purchase in Jenks should occur. There was a strong desire to keep the airport for very small aircraft. In relation to the environment, flooding of Jenks was a real problem. Jenks wanted additional soccer fields, and felt they could use airport land; and the community near the airport believed the airport's noisy operations were occurring more since the master plan began. Here it is interesting to note, as you saw on your previous slides, most of the housing development real close to the airport, in fact, was occurring in 1977 and 1978. There was an overall dislike of the airport, as there was no community financial support from the airport based on taxes. The airport was not an asset to Jenks, but an asset to Tulsa; and big old Tulsa was telling little Jenks what to do. Therefore, with this knowledge in hand, some 50 public meetings in 2 years behind us, and an improved knowledge of the community and how they want their relationship with an airport to occur, we established an ANCLUC study in 1978. Our consultants were Howard Needles Tammen & Bergendoff (HNTB), and the airport staff continued to work with the citizens and the user committees. This ANCLUC study would contain 4 major elements: the noise abatement plan; master plan revision, land use management plan; and environmental assessment. We had 4 major objectives, which were: safety and capacity improvements; no expansion into Jenks in line with the Jenks city council request; reduce noise overflights; and compatible land use on the airport and with the community. Here, we wanted to make sure there was community participation and that the users committee and the citizens committee share draft reports; and no one was left out. From this, we began looking at the noise abatement plan which originally consisted of 23 alternatives. In order to fully review these alternatives, we had to educate the public on the level of noise day and night (or LDN's). We wanted to well-define noise so we had flight checks of equipment. We asked 3 different jet operators to fly a series of 3 flights each so that the community could really hear noise. These jets appeared one afternoon, well publicized, and put on a real show for the community with touch-and-go operations, landings to full stop and then takeoff's, high-performance maneuvers, and normal departures. This was in order that we might calibrate the equipment and we could start the noise measurement program, where, in face, we asked the citizens committee to allow us to locate these noise measuring devices in their yards or yards of their friends. Therefore, we wanted to give a comparison to perceived noise and real noise. We found that the real noise in the neighborhood occurred from barking dogs, motorcycles, dump trucks, and normal vehicular activity, as well as lawnmowers, rather than from the airport. The real problem in the community was the problem of overflights, or flight tracks, as well as some night operations. Therefore, we began to develop a plan which would solve this real problem. First of all, we looked at voluntary restrictions on night operations, where operators and tenants would be informed of the desire to keep a quiet footprint and try to minimize night operations with the use of the west north/south runway. The patterns would be made wider and longer and elevated to keep traffic away from Jenks. Obviously, as traffic increases at the airport, the patterns become wider and longer. Here, I think it is good to note that about this time, Oral Roberts announced his City of Faith hopsital development, which would include a 60-story building which would be located 8,200 feet east of the airport and would definitely affect our pattern operation. This development violated airport zoning; however, we found that through pattern changes by increasing the altitude, which we needed to solve some problems at Jenks, we could solve the problem of the development of the City of Faith. Therefore, the traffic pattern was raised from a 400-foot pattern to a 900-foot pattern, widened around the City of Faith (or inside the City of Faith for some activities) and lengthened considerably. We did find that if jet or heavy aircraft activity occurred, we felt we should use the NBAA departures; and we felt we should move training activities to the western runway. As you probably have perceived by now, the airport is primarily a training airport, with tough-and-go activities on the east side of the airport over Jenks. We believed, in order to help the perceived problem of overflights in the community, it would be best to move this training traffic to the west side and the transient traffic to the east. Therefore, development of hangars on the east side of the airport would be essential to force this movement to the east. In order to do this completely, we found that we needed to extend runways to the north and displace thresholds on the south. This move, in fact, would take noise for a normal airport operation away from Jenks. Therefore, the runway extensions, as shown, were developed. The displaced thresholds force noise away from the community: and, in actual noise measurement, we find that it will force the noise to the north and improve the community environment itself. Taxiways would be added to improve taxi distances between the runways, and an ILS was recommended from the north to the south for training purposes. All run-up's would be on the north end of the airport, putting the noisiest operations next to agricultural areas where they had previously occurred somewhat on the south; and the FBO's would be limited to the southwest portion of the airport. Additionally, there would be education of people in the flight schools to show what could be done by them to improve the noise environment around RVS.

As the citizens were generally in concurrence with this noise abatement plan, we decided to move forward with master plan revisions which we felt would be acceptable to the community. Of course, in the master plan itself, we once again took inventory of the airport; and, in line with my commitments to the community when we started the discussions for education of the community, we had not made any major changes to the airport. However, we did find that the aircraft fleet had grown to 337; and this was in 1978. A total of 313, 288 aircraft operations had occurred. As you can see, we had planned for 322,000 operations by 1995 in our previous master plan; and we said we would have 403 aircraft based at the airport in 1980. Obviously, we were on our way to that point at this time. The airport, therefore, was continuing to grow, even though we were in the review process. The normal growth had been fantastic. We now had to revise our forecast of aircraft operations upward to 453,000 operations in the year 2000; and we were now forecasting 434 aircraft based on the airport by the year 2000. However, we were not changing the types of aircraft that were using the airport previously. This, too, is in line with our commitment to the community that we would keep the same type of operation which had existed since 1953 on the airport until the year 2000. The community was getting some confidence in our statements by this point, and we were approaching 1979 at this time. As you can see from the slide, in the master plan process, we were planning mostly to extend the runways to the north: and this was on airport property, in line with Jenks' stated requirements. We were planning to balance aircraft operations by putting the training activities on the west runway and the transient activities on the east runway. Traffic flow was now being accommodated by new connector taxiways between runways, and instrument training could occur by installation of an ILS from the north to the south. The south is our predominant wind coverage area, and the small aircraft operators wanted no ILS. However, this problem was overcome to some extent.

Secondly, we wanted to control aircraft maintenance noise by location in the southwest portion of the airport where all the major aircraft noise would occur in a centralized area away from the community. Next, we wanted to look at the drainage which was of great importance to the city of Jenks. However, we decided to keep all the drainage on the airport for the 100-year flood situation and prevent flow through Jenks. Therefore, they would not need their drainage project; and, therefore, the would not need funding. This seemed satisfactory to the citizens committee; and, in a brief discussion with the city council, it made them very happy now that they could spend their money on a sewage plant. This created, obviously, a greatly improved situation off the airport with regard to drainage and other perceived community problems. Now, we wanted to acquire land to the north which is in the flood plain, mostly agricultural area, and would include only one farm and one family of 4 people. In addition, we wanted to develop a perimeter road system which would keep on-airport traffic on the airport and not put it on community roadways, which once again addressed the community's concern of road access to the major freeway system. Therefore, the basic elements of the master plan were evolving in a phased construction program wherein only $5 million now would be spent in the developmental process, thus saving the airport significant monies through the review process; and on-airport operations were totally controlled with a master plan acceptable to the majority of users and community.

This master plan program, therefore, met the requirements of the community concerns.

Now, we went to land use management plan for the surrounding areas. In this area, we basically addressed the LDN contour effect on the existing areas surrounding the airport and the single-event noise contour impact on the community, as well as noise complaints which now had become very numerous since we had been discussing the airport and prior to the master plan itself, which had averaged less than 50 complaints per year, and flight track expansion effect on any surrounding community areas. This created a need for new airport zoning which basically falls in line with the existing land uses and places most of the aircraft activities over agricultural areas and around Oral Roberts' new 60-story building. In addition, we had to review water projects and their effect on the airport in the regard that drainage and drinking water supplies, as well as crash/fire/rescue (C/F/R) water supply, were difficult problems to overcome. Drainage, of course, being held on the airport and flow through other areas were addressed in our master plan. However, water supply to the airport had a definite effect; and we felt these projects could be addressed effectively with the proper land-use controls. In fact, we looked at deannexing a portion of Tul-a (which is indicated in yellow) and allowing the city of Jenks to obtain this land for additional tax revenues if they would provide water supply to RVS from their water pipes. It is a little ironic at this point to note that the city of Tulsa supplies the city of Jenks water with the waterline that runs across the airport; however, because agreements, the airport is unable to tap this supply and provide its own water. Therefore, we are rebuying the water from Jenks; and Jenks is obtaining revenue for that water system from land deannexed from Tulsa and revenues from airport use. Therefore, the land-use plan basically went along the lines of existing areas surrounding the airport and met, once again, the needs of Jenks community which had the largest impact on the airport's environment. This did include the District 8 plan, which is a comprehensive growth plan for the city of Jenks and is part of the Tulsa metropolitan area planning system. The last element of this ANCLUC study was the environmental impacts. At this point, we were able to note (as we did in the previous master plan, but now the public was educated) that we had reduced noise impact on Jenks. At this time, we were buying only one farm and only 8 homes are in the LDN 65 area. There, in real life, is no taking of homes in Jenks; and the wildlife impacts, historical archilogical effects, and air quality standards were not adversely impacted. Therefore, based on the LDN criteria, we were moving noise effectively to the north and away from the community; we were spending less money; we were getting the flexible airport we really wanted when we began the master plan study in 1972; and we were truly helping the community which surrounds our airport by improved drainage, improved quality of life, and supply of revenues in truth to that community. The community concerns had been addressed with long hours of education of the community, which could have been avoided if we had taken that approach at first to listen to the community needs before the planning process, educated the community on the airport's relationship, and been open-minded to a very close working environment of the surrounding citizens and the airport needs.

I am not saying that everyone in the community loves the airport now; in fact, to complete the ANCLUC process, we did hold a public hearing in October of 1979. We had only 7 speakers at this point, and they mostly made minor suggestions about certain elements of the projects so that fine tuning could occur. One person, though, did state that she did not like the airport and wanted the airport out. However, this is quite different from the original setting which had previously occurred. The community, now, is accepting the airport as a part of the community and believes that we are, in truth, working parallel to our commitment to the master-planning and ANCLUC process. The first phase of development, now, which is a drainage program, is occurring; and we are proceeding with the program implementation. We have raised the flight pattern; we are educating the students and FBO's; and we are shifting traffic as we said we would.

We did run into a minor problem that, in fact, the ILS from the north to the south would not work, technically. We lost our visual OMNI range to the south due to development of a water tank from another community (Glenpool, Oklahoma); and we felt that a south installation of an ILS should occur. This installation would be on city of Tulsa annexed by Jenks. Therefore, we went back to the city council to request their concurrence with this minor change, which was addressed in the ANCLUC study. We, once again, ran into some very vocal opposition. The community wants to stand on their statement that no improvements occur to the south, they voted to not agree to the ILS installation to the south. This if further being pursued by the FAA at this time, and the Tulsa Airport Authority (TAA) had taken the stance that this must be installed. Training ILS's have been installed at Tulsa International Airport and another reliever airport (Okmulgee). Therefore, there is no longer a need for a training ILS at RVS; and an actual instrument-use ILS is most appropriate at this time. This, too, will be worked out; and we believe we will keep our commitments to that community to provide an airport that is effective, efficient, and safe, as well as compatible with that community.

Overall, we feel the total process was an education for the airport staff and the community in the fact that we must work together; and we, at this time, definitely believe in the ANCLUC methodology and the community working relationship it brings about. The LDN sound measuring criteria seems more effective than the CNR or the ASDs; therefore, we concur that this delineator should continually be used. This, therefore, completes the case study of RVS, which, by the way, received the name Richard Lloyd Jones, Jr. Airport in July of 1978 to honor Chairman of the TAA, who at that time was retiring after 30 years of being on the TAA and acting as Chairman for 16 of those 30 years. This, also, was the mark of the 50-year history of Tulsa International Airport. We believe Jones Airport (previously Riverside Airport) will continue to be an effective and functioning airport for the next 20 years because of this process.

CASE HISTORY - WESTCHESTER COUNTY AIRPORT

SCOTT PIPER
WESTCHESTER COUNTY AIRPORT

CASE HISTORY - WESTCHESTER COUNTY AIRPORT

Westchester County Airport holds the dubious distinction of being the most noise sensitive airport on the East Coast. As the leading corporate use airport in the country, it was naturally to become a center for early operation of corporate jets. The problems that those early models were to cause at many airports around the country with noise, and other detrimental environmental impacts then, came first to Westchester. One of these problems was a suit filed in 1974 in the United States District Court for the District of Connecticut for twenty million dollars in inverse condemnation of property in the Town of Greenwich, Connecticut, which lies along the eastern boundary of the airport. That particular action was settled by a stipulation entered into between the parties in 1975 which among other things created an Advisory Committee for Westchester County Airport to discuss problems of noise, emissions and/or safety. More about that later.

Profile Airport and Area

Westchester County Airport is the home of some 400 based aircraft, 108 of which are corporate jets, making it the largest corporate jet base in the country. Annual operations are approximately 210,000 per year. We have six air carrier and 24 commuter airline flights daily and board approximately 100,000 passengers annually. The airport is predominantly a general aviation facility.

The airport is located in the Towns of North Castle, Harrison and Rye, New York, and borders the Town of Greenwich, Connecticut, along its eastern boundary.

To illustrate the character of the area, let me describe Greenwich, Connecticut in more detail:

- Population of 63,000
- Median income after taxes is $32,100
- Average home sale in 1980 - $264,552
- Average home sale in airport district - $334,434.

ANCLUC

In 1977, the County applied for a Planning Grant to fund a Master Plan for the airport. As the grant application was being processed, the FAA through the Airport District Office requested that the County amend the proposed Master Plan study program by the addition of a formal ANCLUC study in view of "the location of the airport in a noise sensitive area and its history of community reaction."

A Study Design was approved and work began in the last half of 1978. As conceived, the ANCLUC Study was comprised of ten elements including a:

- Description of the Noise Environment
- Development of a Noise Abatement Plan
- Development of a Land Use Management Plan.

All tasks were intended to include a series of public workshops where open discussion could take place.

The first product of the study was the "Short Term Noise Abatement Plan". In it, eighteen operational procedures were evaluated according to a series of factors including noise, safety and other aviation and environmental concerns. Of the eighteen procedures evaluated, only two were recommended for immediate implementation. They were:

(Op. Ch #6) ● Channelization of helicopter traffic
(Op. Ch #12) ● Preferential Runway Use Plan, Specific Times Only.

Three other procedures were recommended for future implementation depending on other considerations. They were:

- Parallel VFR Runway
- Acoustical Barrier for Jet Run-ups
- Removal of an ATC Altitude Restriction on Runway 16 Departures.

Here, a comment from the introduction to the Short-Term Noise Abatement Plan is appropriate.

"It is important to note that the ANCLUC Study for Westchester County Airport has been preceded by several years of intensive effort by local aviation interests to abate noise. County officials, airport management, pilot groups, tower personnel, and citizens groups worked together constructively and have spent many hours of effort to reduce aircraft noise impacts while maintaining necessary airport service levels and protecting the economic asset which the airport has become. Little has escaped the attention of these groups to investigate as potential noise abatement techniques for Westchester County." Or in other words, in terms of noise abatement techniques, we were already doing it at Westchester.

Land Use Management Plan

The next product of the ANCLUC Study was the "Land Use Management Plan" whose purpose was to "promote a pattern of land use in the airport vicinity which is compatible with (airport) noise levels." Using the L_{dn} 65 contour as the maximum desirable for residential use, it was found that only 60 persons lived within this so called Primary Impact Area. Clearly our experience indicated that noise concerned many more than the sixty residents within the 65 L_{dn}. So at our request, an analysis was made of the area outside and between the 60-65 L_{dn} contours. In this Secondary Impact Area we found a population of 4,700 persons outside the 60 L_{dn} and 1,900 persons between the 60-65 L_{dn}. Perhaps indicating what the community had been telling us for some time, which was that the relatively rural atmosphere of the area was not comparable to the more highly developed residential areas where a 65 L_{dn} level might be tolerable for residential use. In terms of Federal guidelines however, we concluded from the above and from studies that indicate that future development in the area is planned as non-residential that our potential land use conflicts are minimal. Nothwithstanding the fact that in terms of community perception, they are of great magnitude and growing.

Noise Abatement Plan

Noise monitoring tests were conducted to validate the computer generated noise contour data. The tests together with our own sampling of community noise levels with portable airport equipment tended to verify the computer data.

From my perspective, that is from the perspective of the Airport Manager, the results of the study to date have been disappointing in that they have failed to assuage the concerns of the neighboring communities significantly though not due to lack of action on behalf of the airport, but because:

- All promising noise abatement actions have been taken, and
- Average noise levels in the surrounding communities are not that great.

When then has this left us? The answer is, unfortunately, nowhere! The community says we haven't done anything and the airport users say, we have done all we can do to minimize noise. Both are right. But both are also disappointed because they both expected more from ANCLUC. But the story doesn't end here. Perhaps in normal times the two sides would work together and continue to make progress to reduce noise. However, other events intervened to make things anything but normal. Concurrent with the ANCLUC Study these events were taking place.

The Master Plan that had originally spawned the ANCLUC Study was concluding. With strong direction from the County to constrain development, the Master Plan consultants had completed their recommendations and produced an Airport Layout Plan that was intended to maintain the existing general aviation character of the airport yet continue to permit limited air carrier use, corporate jet and light general aviation uses. Proposed on the Airport Layout Plan were six additional corporate hangars, a new terminal to replace an existing World War II quonset hut, a parallel light general aviation runway and FBO and T-hangar facilities. Also proposed were drainage improvements, easements to protect extended runway safety areas, lines of sight and approach lights. A modest plan at most airports.

Another event was the installation of a second ILS to serve Runway 34. This installation was intended to supplement the existing ILS on Runway 16 and permit the discontinuance of a noisy circling approach procedure then in use. While the FAA and the County felt that both safety and noise would be enhanced with the new ILS, residents in the area under the new approach filed suit in Federal Court to prevent the installation and use of the system claiming in fact that noise and safety would be compromised by its use.

With airline deregulation came yet another event. One of the new start-up air carriers in the New York area filed with the CAB for authority to serve 33 new markets. Included as one of the service points was White Plains, New York, served through Westchester County Airport. As is normal under such filing, the carrier filed proposed illustrative schedules that showed service to White Plains to and from each new service point for a total of 33 new air carrier flights from our airport. The County quickly responded in opposition to the proposed service but ran headlong into the new deregulation language that prevent any sponsor from artifically restricting airport access leaving the neighbors fearing that the County could no longer control the character and use of the airport.

And last but probably of most significance, a very tragic accident occurred when a corporate jet crashed in a wooded area while on an ILS approach about 3/4 mile from the airport killing its eight occupants. This was followed a week later by the crash of a twin-engine private aircraft while also on ILS approach to the same runway. Fortunately, in this case, the sole occupant, the pilot, was uninjured and walked away from the aircraft. This, of course, was of little solace to many airport neighbors who immediately demanded that the airport be closed in bad weather.

So in spite of what we felt were extraordinary measures to control airport development and minimize noise impacts on our neighboring communities, we found airport opposition groups organizing all around us fueled by our notoriety in the local press. Residents who had never noticed air traffic before suddenly became aware of flights over their homes and objected. In fact, the organizer of one group located beyond the Outer Marker admitted he never knew traffic patterns routed flights over his area until he read about it in the paper, went outside and looked up and saw airplanes and now was joining those complaining about noise though he had resided in the same home for the past five years.

Pressure from these groups led to the passage of a mandatory curfew which was implemented at the airport on October 1, 1981, prohibiting all but emergency traffic from midnight to seven a.m. It should be noted that this type of restriction was evaluated in the ANCLUC Study but rejected as not desirable due in part to the few number of operations during the night.

Conclusion

To say that the ANCLUC Study has not been useful is probably too critical, yet it has not brought about a resolution to our noise problems.

It has been reassuring to have the ANCLUC Study reconfirm measures already taken by concerned management. However, future progress in noise control at Westchester County Airport won't result from further studies. Instead, progress will come from the hard work and dedication of management, user groups and community leaders. It will not be easy!!